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INSTALLATION RESTORATION PROGRAM
PHASE I - RECORDS SEARCH
AIR FORCE PLANT NO. 36, OHIO

Prepared For

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida
and
HQ ASD/PMD
Wright-Patterson AFB, Ohio

July 1985

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This report provides the Installation Restoration Program (TRP) Phase I-Records Search for Air Force Plant 36, Evendale, Ohio. This is a report of a study conducted to identify past potentially hazardous material disposal sites. Interviews and document searchs were conducted to determine sites that were potentially contaminated.

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EXECUTIVE SUMMARY

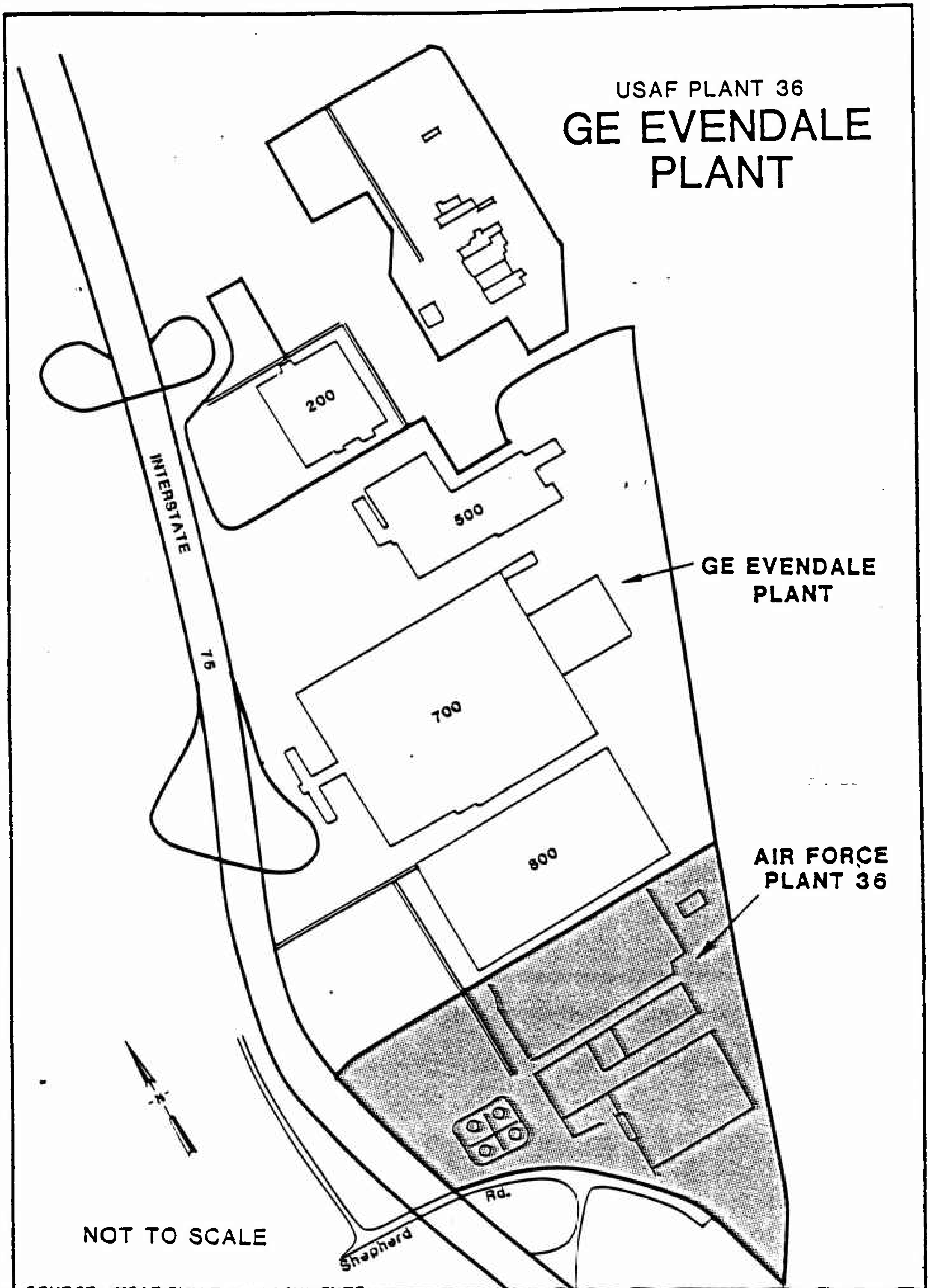
The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Air Force Plant 36 under Contract No. F08637-83-G-0005.

INSTALLATION DESCRIPTION

Air Force Plant 36 is located in Evendale, Ohio, approximately 12 miles north of Cincinnati. The plant site is contiguous to, and is commonly considered to be a part of, the General Electric Company's Evendale plant (see Figure 1). The area surrounding the plant is a mixed industrial-residential area. The plant site is owned by the Air Force and encompasses 66.39 acres. The Air Force Plant 36 plant site is characterized by very limited grass and soil areas; almost the entire plant site is covered by buildings or paved areas. The adjacent General Electric Company Evendale plant consists of approximately 334 acres, most of which is also covered by buildings and paved areas.

Air Force Plant 36 began during World War II as an aircraft engine production plant. The plant's buildings were constructed during 1940 through 1944 on land which had been farm land. The plant was originally known as the Wright Aeronautical Engine Plant. After World War II, some of the original Air Force property was sold to Autolite, which in turn later sold the facilities to General Electric Company. General Electric also purchased additional facilities and land contiguous to the present

FIGURE 1



SOURCE: USAF PLANT 36 DOCUMENTS

Air Force Plant 36 to form the present General Electric Company Evendale plant.

Air Force Plant 36 has been used to support and supplement the activities of the adjacent G.E. Evendale plant. Various portions of the plant facilities have served as aircraft engine test cells (Building B), storage (Building C-East), machine shop (Building D), and advanced engine research and test facilities (Buildings C-West and D).

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following points relevant to Air Force Plant 36.

1. The mean annual precipitation is 40.59 inches; the net precipitation is +6.59 inches and the 1-year 24-hour rainfall event is 2.5 inches. These data indicate an abundance of rainfall in excess of evaporation (a mean precipitation driving force) which causes a potential for storms to create excessive runoff.
2. The top three feet of soil underlying the plant generally consists of clay and clay loam with moderate permeabilities. A majority of the plant is covered with buildings, asphalt or concrete. Grass and open soil areas are very limited; therefore infiltration will likewise be limited and slow through the clay.
3. A shallow water table aquifer exists approximately 3 to 10 feet deep under most of the plant. This upper Mill Creek Valley aquifer is not utilized as a ground-water source in the vicinity of the plant.
4. A clay confining unit exists under the plant which separates the upper and lower Mill Creek Valley aquifers. This clay may not be continuous beneath the plant.
5. A deeper confined aquifer exists approximately 50 feet deep under the plant. This lower Mill Creek Valley aquifer is utilized as a ground-water source in the vicinity of the plant.

6. Plant 36 discharges storm water runoff to Mill Creek approximately 1,000 feet east of the Plant. Mill Creek is a Water Quality Limited stream due to numerous urban and industrial discharges both north and south of Plant 36.
7. There are no federally-listed or state-listed endangered or threatened species on Plant 36.

METHODOLOGY

During the course of this project, interviews were conducted with installation personnel familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field surveys were conducted at suspected past hazardous waste activity sites. Two sites (Figure 2) were initially identified as potentially containing hazardous contaminants and having the potential for contaminant migration resulting from past activities. These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix E and the results of the assessment are given in Table 1. The HARM score is a resource management tool which indicates the relative potential for adverse effects on health or the environment at each site evaluated.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team field inspection, reviews of plant records and files, interviews with base personnel, and evaluations using the HARM system.

The area found to have sufficient potential to create environmental contamination is as follows:

- Underground Fuel Leak northwest of Building B

FIGURE 2

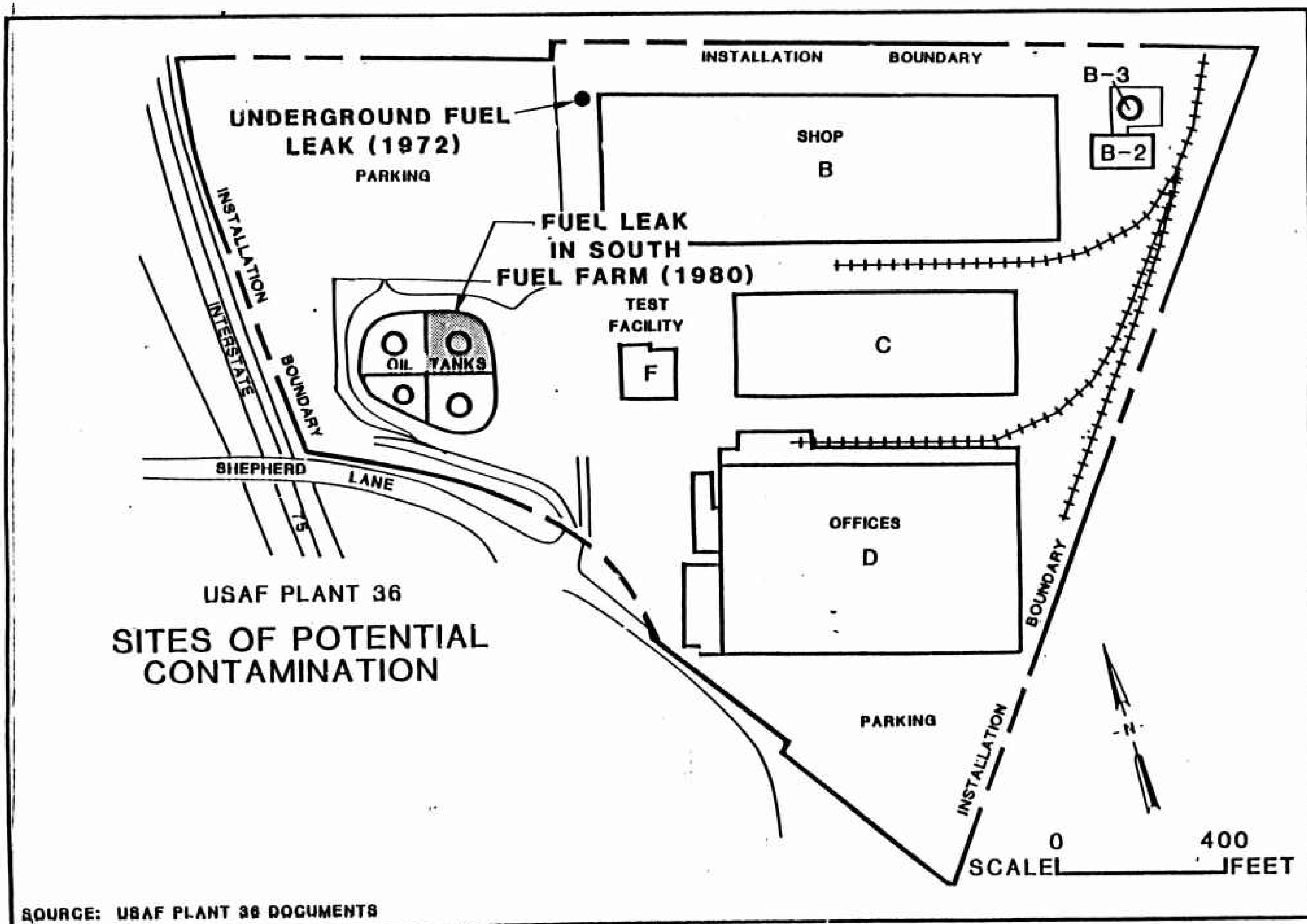

INSTALLATION BOUNDARY
UNDERGROUND FUEL LEAK (1972)
PARKING
SHOP
B
B-3
B-2
FUEL LEAK IN SOUTH FUEL FARM (1980)
TEST FACILITY
F
C
OIL TANKS
INSTALLATION BOUNDARY
INTERSTATE
75
SHEPHERD LANE
OFFICES
D
PARKING
BOUNDARY
INSTALLATION
N
SCALE 0 400 FEET
USAF PLANT 36
SITES OF POTENTIAL CONTAMINATION
SOURCE: USAF PLANT 36 DOCUMENTS

TABLE 1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY
AT AIR FORCE PLANT 36

Rank	Site	Operation Period	HARM Score(1)
1	Underground Fuel Leak Northwest of Building B	1972	52
2	Fuel Spill at South Fuel Farm	1980	46

(1) This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix E. Individual rating forms are in Appendix F.

The area judged to have minor potential to create environmental contamination is as follows:

- o Fuel Spill at South Fuel Farm

RECOMMENDATIONS

A program for proceeding with Phase II and other IRP activities at Air Force Plant 36 is presented in Section 6. The recommended actions include soil borings, monitoring wells and a sampling and analysis program to determine if contamination exists. This program may be expanded to define the extent and type of contamination if the initial step reveals contamination. The Phase II recommendations are summarized in Table 2.

TABLE 2
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT AIR FORCE PLANT 36

Site (Rating Score)	Recommended Monitoring Program
Underground Fuel Leak Northwest of Building B (52)	One soil boring and subsequent monitoring well for confirmation of contamination. If confirmed, three additional wells to define extent of contamination. Soil and ground-water analyses (see Table 6.2).
Fuel Leak in South Fuel Farm Area	One soil boring by hand auger technique for confirmation of contamination. If confirmed, three additional borings to define extent of contamination. Soil analyses (see Table 6.2).

Source: Engineering-Science

SECTION 1
INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force, due to its primary mission of defense of the United States, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites, and Federal agencies are required to make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP is the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, clarified by Executive Order 12316. CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

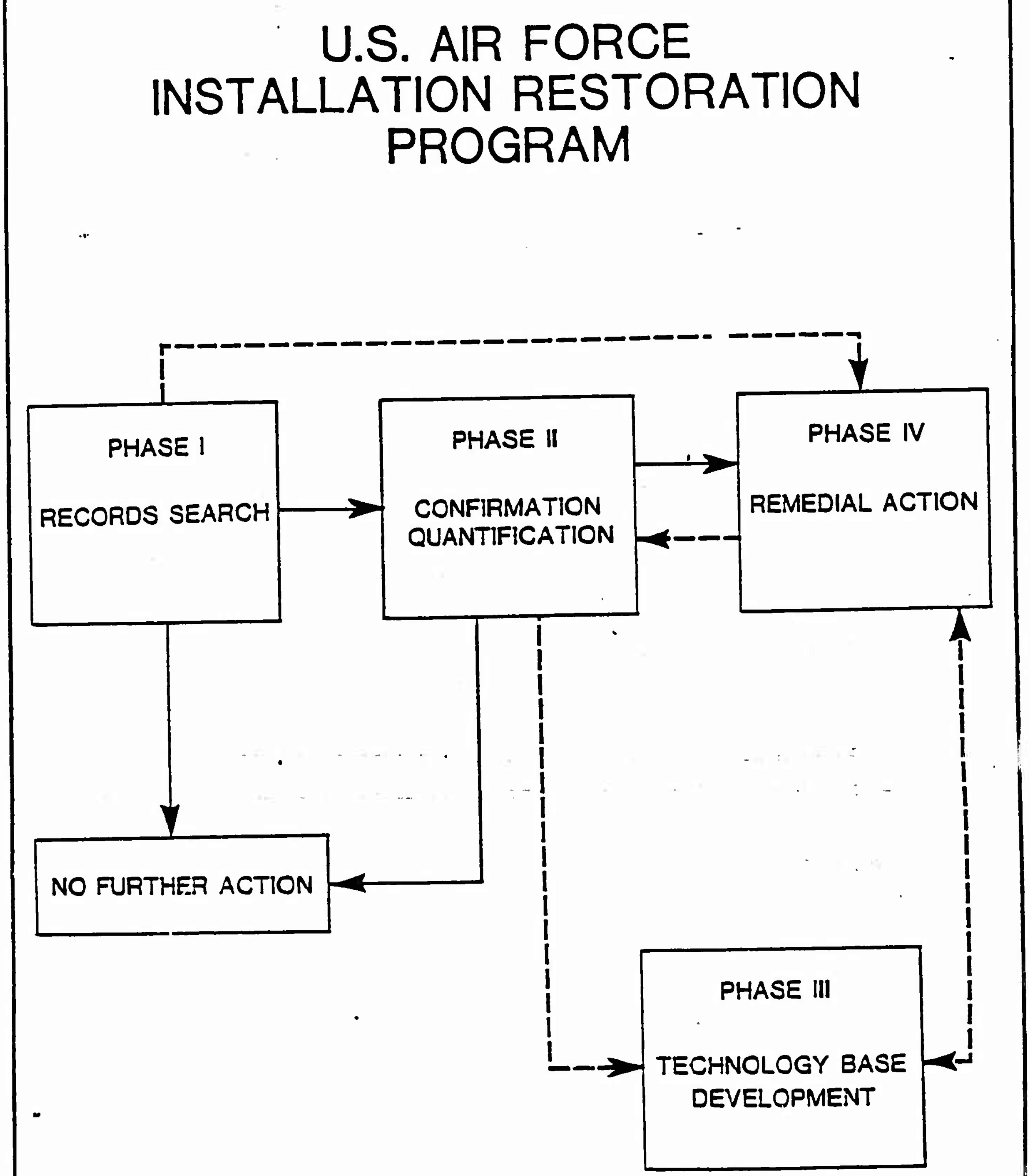
PURPOSE AND SCOPE

The Installation Restoration Program is a four-phased program (Figure 1.1) designed to assure that identification, confirmation/quantification, and remedial actions are performed in a timely and cost-effective manner. Each phase is briefly described below:

- Phase I - Installation Assessment/Records Search - Phase I is designed to identify and prioritize those past disposal sites that may pose a hazard to public health or the environment as a result of contaminant migration to surface or ground waters, or have an adverse effect by its persistence in the environment. In this phase it is determined whether a site requires further action to confirm an environmental hazard or whether it may be considered to present no hazard at this time. If a site requires immediate remedial action, such as removal of abandoned drums, the action can proceed directly to Phase IV. Phase I is a basic background document for the Phase II study.
- Phase II - Confirmation/Quantification - Phase II is designed to define and quantify, by preliminary and comprehensive environmental and/or ecological survey, the presence or absence of contamination, the extent of contamination, waste characterization (when required by the regulatory agency), and to identify sites or locations where remedial action is required in Phase IV. Research requirements identified during this phase will be included in the Phase III effort of the program.
- Phase III - Technology Base Development - Phase III is designed to develop a sound data base upon which to prepare a comprehensive remedial action plan. This phase includes implementation of research requirements and technology for objective assessment of adverse effects. A Phase III requirement can be identified at any time during the program.
- Phase IV - Operations/Remedial Actions - Phase IV includes the preparation and implementation of the remedial action plan.

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Air Force Plant No. 36

FIGURE 1.1



SOURCE: AFESC

under Contract No. F08637-83-G-0005. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommended follow-on actions. The land area included as part of the Air Force Plant 36 study is a 66.39 acre tract of land designated as Air Force Plant No. 36. This property is contiguous to the General Electric Company's Evendale, Ohio Plant.

The activities performed as a part of the Phase I study scope included the following:

- Review of site records
- Interviews with personnel familiar with past generation and disposal activities
- Survey of types and quantities of wastes generated
- Determination of current and past hazardous waste treatment, storage, and disposal activities
- Description of the environmental setting at the plant
- Review of past disposal practices and methods
- Reconnaissance of field conditions
- Collection of pertinent information from federal, state and local agencies
- Assessment of the potential for contaminant migration
- Development of recommendations for follow-on actions

ES performed the on-site portion of the records search during April 1984. The following team of professionals was involved:

E.H. Snider, P.E., Chemical Engineer and Project Manager, 10 years of professional experience.

H.D. Harman, Jr., P.G., Hydrogeologist, 9 years of professional experience.

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Air Force Plant 36 Records Search began with a review of past and present industrial operations conducted at the installation. Information was obtained from available records such as shop files and real property files, as well as interviews with 18 plant employees from various operating areas. Those interviewed included personnel associated with environmental engineering, fuels management, roads and grounds maintenance, fire protection, real property, industrial hygiene and safety. A listing of interviewee positions with approximate years of service is presented in Appendix B.

Concurrent with the employee interviews, the applicable federal, state and local agencies were contacted for pertinent study area related environmental data. The agencies contacted are listed below and in Appendix B.

- City of Reading Water Plant
- City of Wyoming Water Department
- Hamilton County Health Department
- Metropolitan Sewer District, Cincinnati, Ohio
- Ohio Environmental Protection Agency
- Ohio Department of Natural Resources
- Ohio-Kentucky-Indiana Regional Council of Governments
- Southwestern Ohio Water Company
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey, Water Resources Division
- U.S. Soil Conservation Service

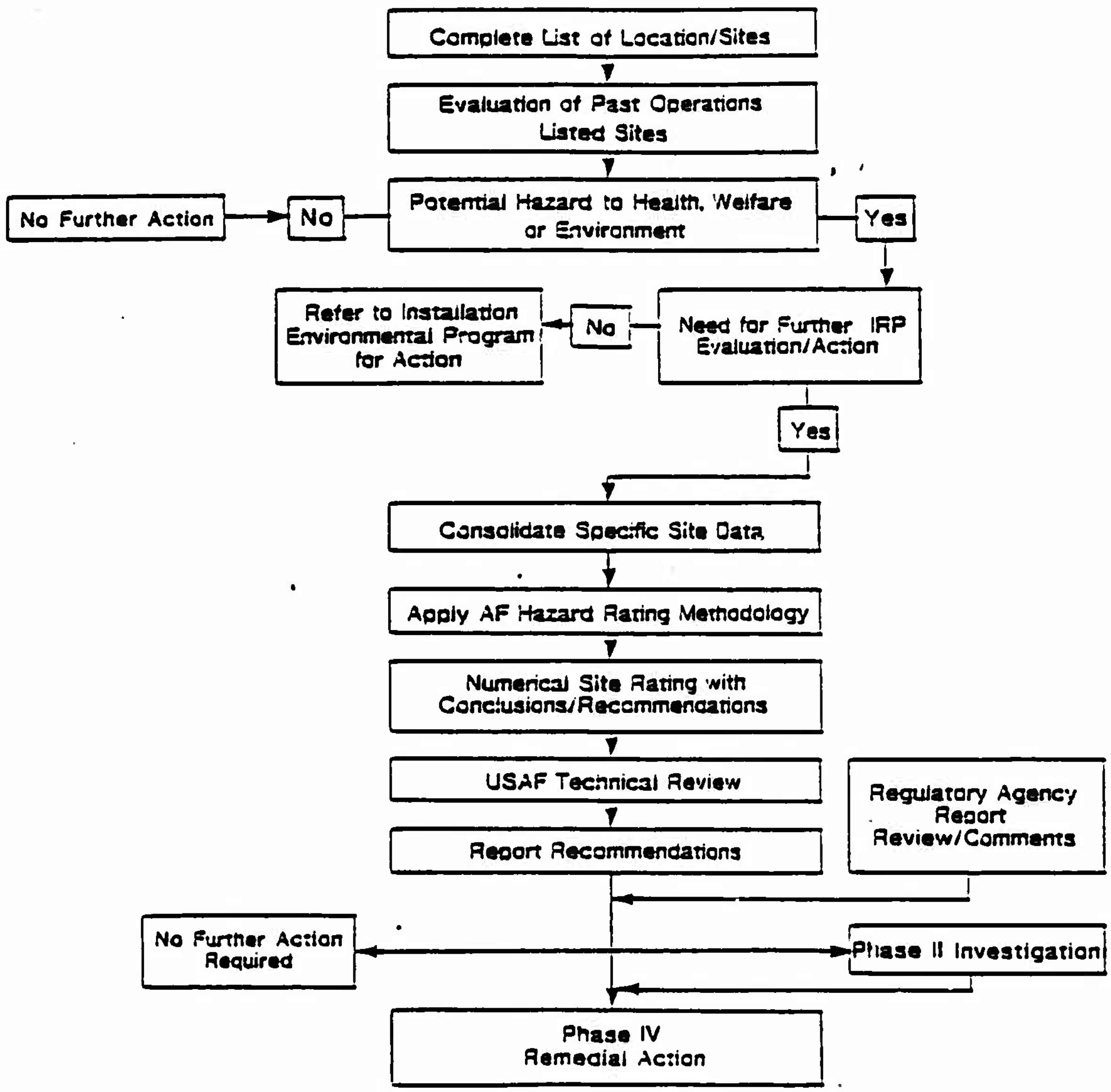
The next step in the activity review was to identify all sources of hazardous waste generation and to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various sources at the plant. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour of the identified sites was made by the ES Project Team to gather site-specific information including: (1) general observations of existing site conditions; (2) visual evidence of environmental stress; (3) presence of nearby drainage ditches or surface waters; and (4) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential hazard to health, welfare or the environment exists at any of the identified sites using the Flow Chart shown in Figure 1.2. If no potential existed, the site received no further action. For those sites where a potential hazard was identified, a determination of the need for IRP evaluation/action was made by considering site-specific conditions. If no further IRP evaluation was determined necessary, then the site was referred to the installation environmental program for appropriate action. If a site warranted further investigation, it was evaluated and rated using the Hazard Assessment Rating Methodology (HARM). The HARM score is a resource management tool which indicates the relative potential for adverse effects on health or the environment at each site evaluated.

PHASE I INSTALLATION RESTORATION PROGRAM

RECORDS SEARCH FLOW CHART



Source: AFESC

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE, AND BOUNDARIES

Air Force Plant 36 is located in Evendale, Ohio, approximately 12 miles north of Cincinnati (see Figures 2.1 and 2.2). The plant site is contiguous to, and is commonly considered to be a part of, the General Electric Company's Evendale plant. The area surrounding the plant (see Appendix D) is a mixed industrial-residential area. The plant site is owned by the Air Force and encompasses 66.39 acres. The facility site plans for Air Force Plant 36 and the adjacent GE Evendale plant are shown in Figure 2.3. The Air Force Plant 36 plant site (Figure 2.4) is characterized by very limited grass and soil areas; almost the entire plant site is covered by buildings or paved areas. The adjacent General Electric Company Evendale plant consists of approximately 334 acres, most of which is also covered by buildings and paved areas.

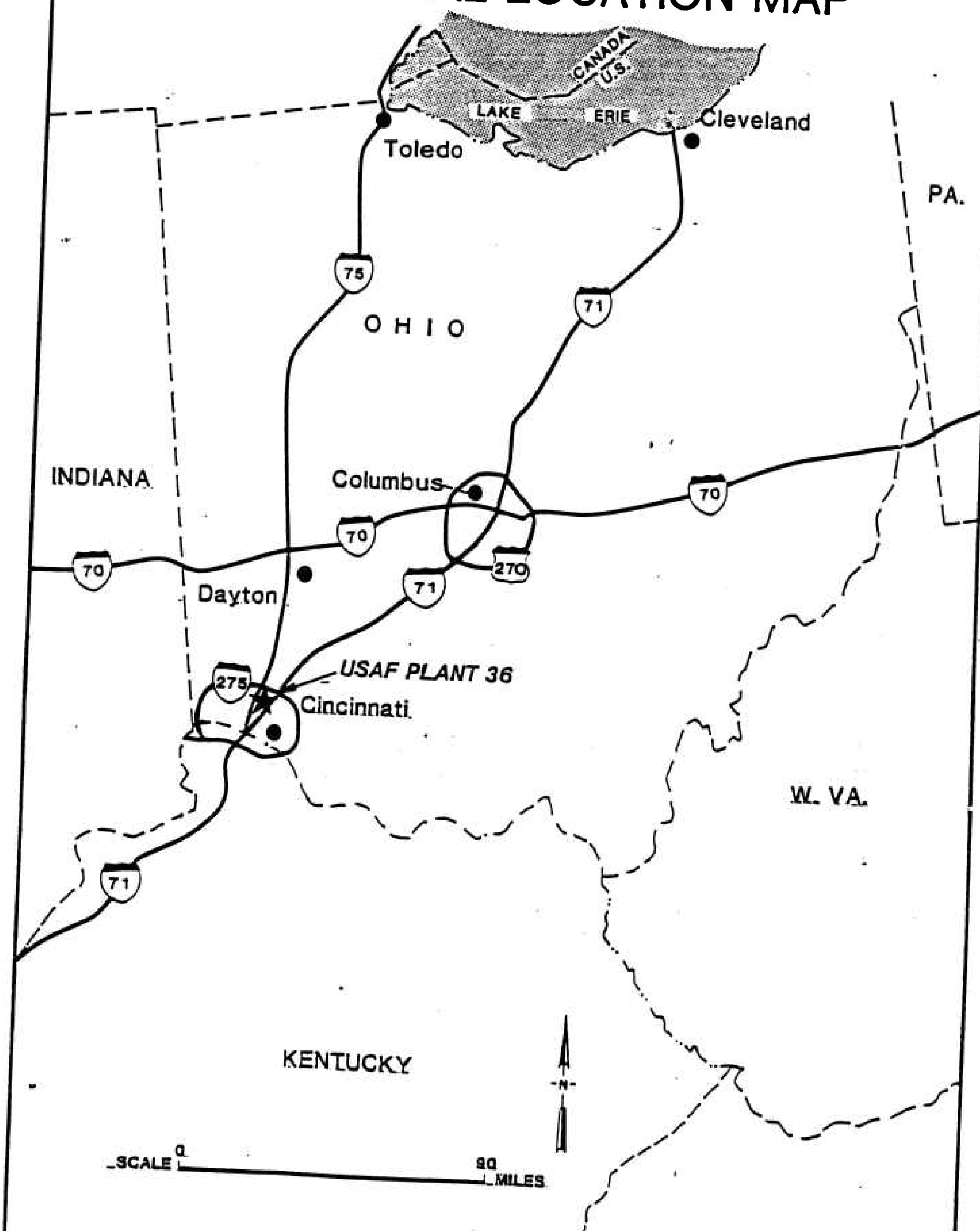
HISTORY

Air Force Plant 36 began during World War II as an aircraft engine production plant. The plant's buildings were constructed during 1940 through 1944 on land which had been farm land. The plant was originally known as the Wright Aeronautical Engine Plant. After World War II, some of the original Air Force property was sold to Autolite, which in turn later sold the facilities to General Electric Company. General Electric also purchased additional facilities and land contiguous to the present Air Force Plant 36 to form the present General Electric Company Evendale plant.

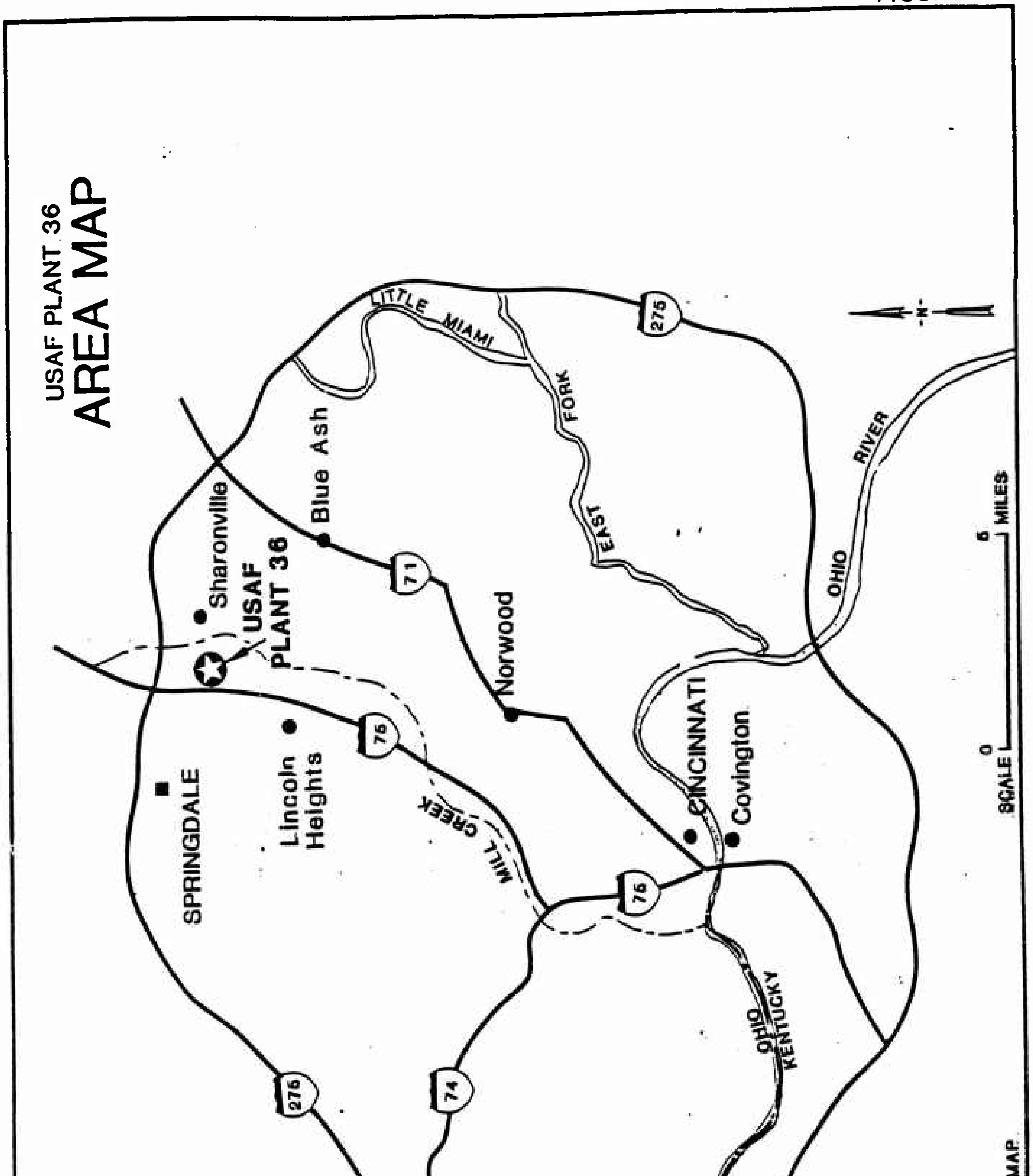
Air Force Plant 36 has been used to support and supplement the activities of the adjacent G.E. Evendale plant. Various portions of the plant facilities have served as aircraft engine test cells (Building B), storage (Building C-East), machine shop (Building D), and nuclear engine research and test facilities (Buildings C-West and D). At present, the

FIGURE 2.1

USAF PLANT 36
REGIONAL LOCATION MAP



SOURCE: COMMERCIAL ROAD MAP


USAF PLANT 36
AREA MAP
USAF
PLANT 36
Sharonville
Blue Ash
Norwood
CINCINNATI
Covington
Lincoln
Heights
SPRINGDALE
INDIANA
LITTLE MIAMI
EAST FORK
OHIO RIVER
OHIO
KENTUCKY
MILL CREEK
275
71
75
75
275
74
N
SCALE
0
5
MILES
SOURCE: COMMERCIAL ROAD MAP

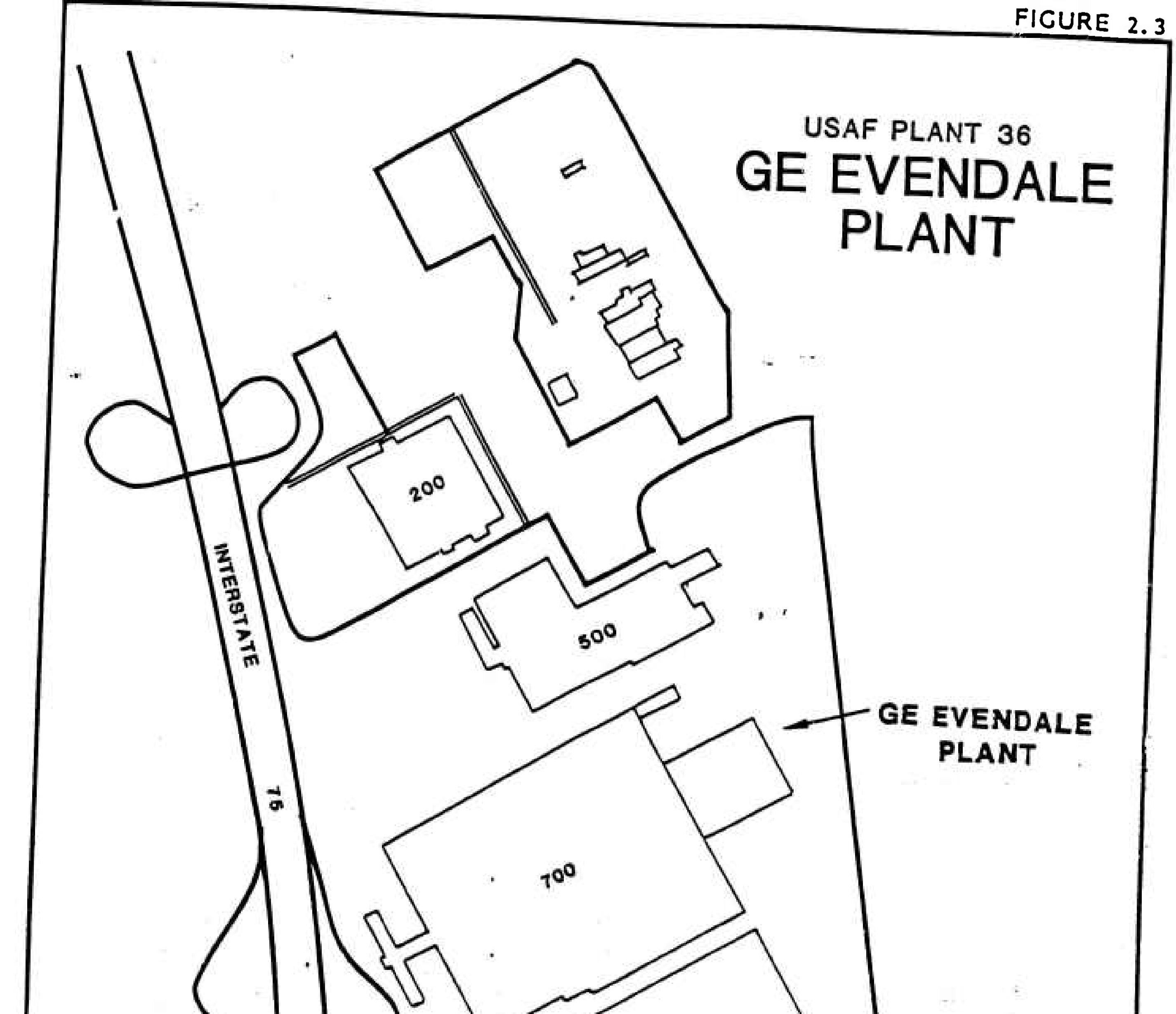
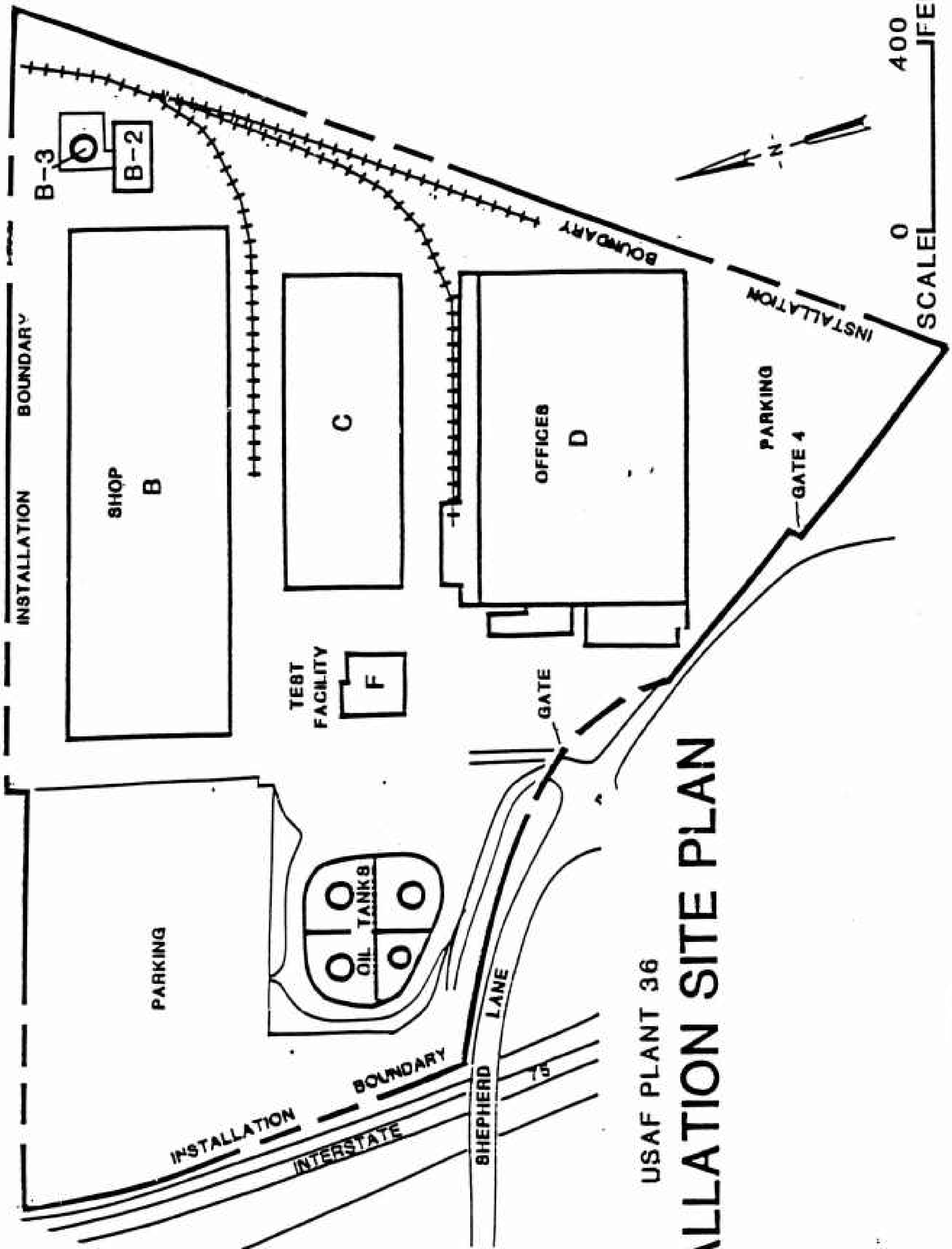

USAF PLANT 36
GE EVENDALE
PLANT
200
INTERSTATE
75
500
700
800
GE EVENDALE
PLANT
AIR FORCE
PLANT 36
N
Rd.
Shepherd
NOT TO SCALE
SOURCE: USAF PLANT 36 DOCUMENTS

FIGURE 2.4



USAF PLANT 36
INSTALLATION SITE PLAN

SOURCE: USAF PLANT 36 DOCUMENTS

facilities are used for aircraft engine test cells, storage, and machine shop activities and the areas previously occupied by the nuclear engine research and test facilities are undergoing a decontamination process.

ORGANIZATION AND MISSION

The host organizations at Air Force Plant 36 are the Aircraft Engine Business Group (AEBG) of General Electric Company and Advanced Energy Programs Development (AEPD) of General Electric Company. The primary mission of Air Force Plant 36 is to support the activities of the G.E. Evendale plant in the production and testing of aircraft turbine engines. The Air Force Plant Representative Office (AFPRO) serves as the administrator for the Aeronautical Systems Division (ASD) contract with General Electric Company.

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting at Air Force Plant 36 is described in this section. An understanding of the geology and hydrology is needed to aid in identifying the hydrologic conditions which could contribute to the migration of contaminants which may have been introduced into the environment at the plant site and potential receptors that might be impacted as a result of contaminant migration.

METEOROLOGY

The climate of the Air Force Plant 36 area is characterized by humid and warm summers and moderately cold winters. The climate is continental in nature with precipitation generally occurring in equal amounts throughout the year. Temperature, precipitation and snowfall data provided by the National Oceanic and Atmospheric Administration (NOAA) are presented in Table 3.1. The data indicate that the mean annual precipitation for the 35-year period of record was 40.59 inches. The estimated lake evaporation for the area is 34 inches (NOAA, 1977).

Two climatic features of interest in the movement of potential contaminants are the net precipitation (precipitation minus evaporation) and the one-year 24-hour rainfall event. The net precipitation is an indicator of the potential for leachate generation. The one-year 24-hour rainfall event is an indicator of the potential for storms to cause excessive runoff and erosion. The calculated net precipitation for the Plant 36 area is plus 6.59 inches indicating an abundance of rainfall. The one-year 24-hour rainfall event for this area is estimated to be 2.5 inches (NOAA, 1963). Excessive runoff may be generated as a result of a one-year 24-hour rainfall event.

TABLE 3.1
CLIMATIC DATA FOR USAF PLANT 36

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Temperature (°F)												
Mean	29.2	32.7	42.0	53.4	63.1	71.6	75.6	74.1	67.3	55.7	43.6	33.9
Precipitation (In)												
Mean	3.45	2.79	3.83	3.59	3.91	4.05	4.15	3.06	2.84	2.62	3.27	3.03
Snowfall (In)												
Mean	7.6	5.3	4.5	0.5	T	0.0	0.0	0.0	0.0	T	2.5	3.7

Period of Record: 1948 to 1983.
T - Trace.

Source: NOAA, 1984.

GEOGRAPHY

Plant 36 is located in the Till Plains Section of the Central Lowland province (Figure 3.1). The Till Plains Section is characterized by a broad plateau which has been cut by several large valleys through which the major streams of the area flow. Plant 36, located in the Mill Creek Valley, is bordered on the north by the General Electric Evendale Plant, on the west by Interstate Highway 75, on the south by Shepherd Lane and on the east by the Conrail railroad tracks.

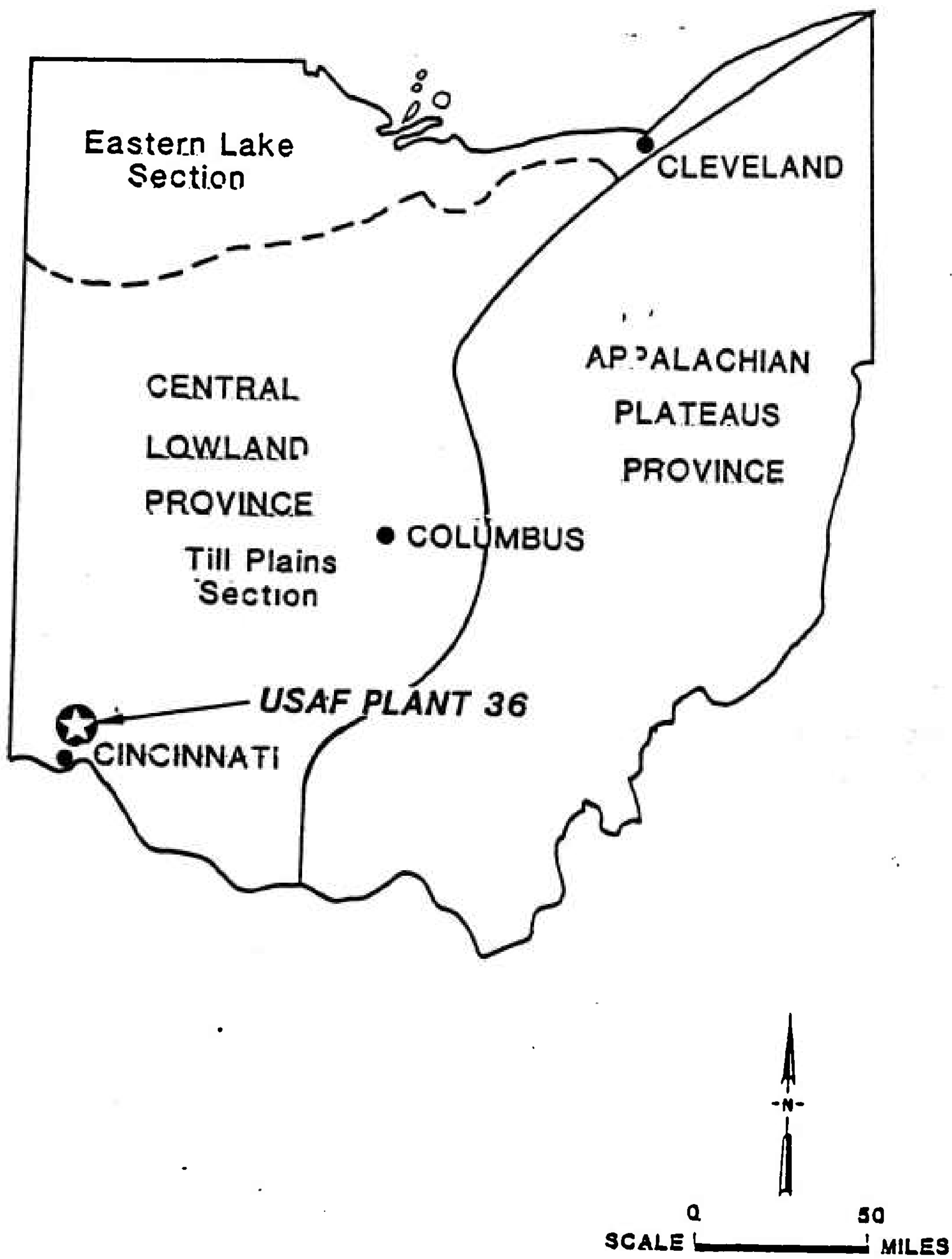
Topography

The topography of the Plant 36 area is a result of glaciation from the north and deposition and erosion of sediments via the ancestral Licking River from the south. The Illinoian stage of glaciation resulted in the deposition of glacial drift (till) in the entire area (Klaer and Thompson, 1948). The ancestral Licking River flowing northward from Kentucky deposited new sand and gravel and likewise cut new channels in the present day Mill Creek Valley. The Wisconsin stage of glaciation also resulted in the deposition of glacial drift (till) in the areas of Butler County approximately five miles north of Plant 36 and along Mill Creek in the area of Plant 36. Prior to glaciation and during the interglacial period the stream valleys were eroded. Today Mill Creek Valley in the vicinity of Plant 36 is a relatively flat area approximately 1.5 miles wide. The land surface elevation of the plant averages about 565 feet above the National Geodetic Vertical Datum of 1929 (NGVD).

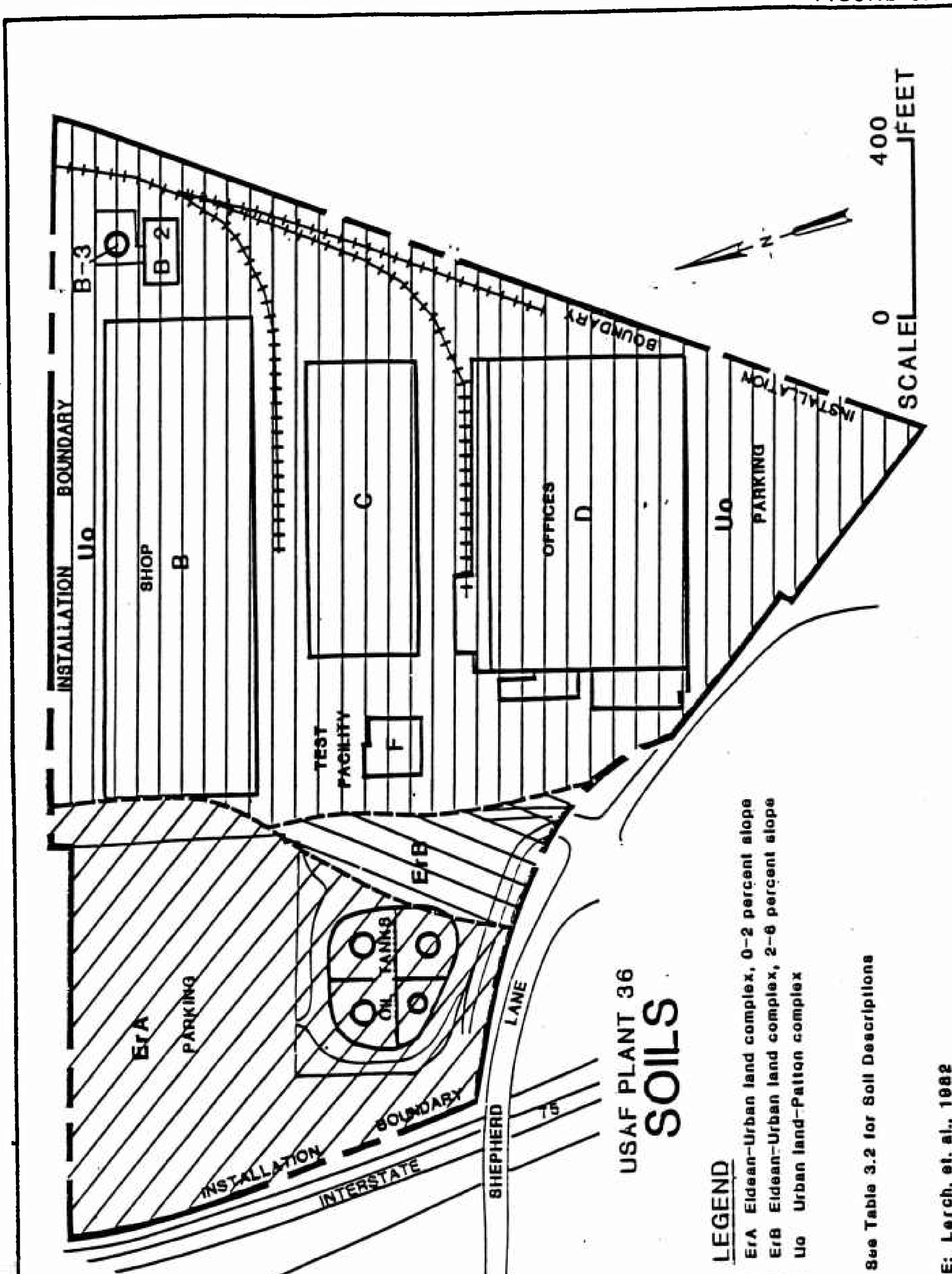
Soils

The soils of Plant 36 are composed of clay, loam, sand and gravel. Figure 3.2 illustrates the three soil types found on the plant. Table 3.2 summarizes the soil descriptions, thicknesses, permeabilities and some limitations of each soil type. All three soil types possess severe use limitations for septic tank absorption fields due to poor filtration, slow percolation and/or ponding. The two soil variations of the Eldean-Urban land complex have a highly permeable stratified sand and gravel zone approximately 3 to 5 feet deep. The Urban land-Patton complex soil type does not have a sand and gravel zone (Lerch, et. al., 1982). The Urban land-Patton complex underlies approximately 75 percent of the plant property including Buildings B, C and D. The Eldean-Urban

USAF PLANT 36
REGIONAL PHYSIOGRAPHIC FEATURES



SOURCE: Bier, 1967



USAF PLANT 36
SOILS

LEGEND
ErA Eldean-Urban land complex, 0-2 percent slope
ErB Eldean-Urban land complex, 2-6 percent slope
Uo Urban land-Patton complex

NOTE: See Table 3.2 for Soil Descriptions

SOURCE: Lerch, et. al., 1982

TABLE 3.2
USAF PLANT 36 SOILS

Symbol on Figure 3.2	Unit Description	Depth (inches)	Permeability (centimeters/second)	Septic Tank Absorption Field Use Limitations
ErA	Eldean - Urban land complex, 0-2 percent slope; loam	0-7	$4.2 \times 10^{-4} - 1.4 \times 10^{-3}$	[1]Severe: poor filter
	Clay, clay loam, gravelly clay loam	7-36	$1.4 \times 10^{-4} - 1.4 \times 10^{-3}$	
	Stratified sand to gravel	36-60	$>4.2 \times 10^{-3}$	
ErB	Eldean - Urban land complex, 2-6 percent slope; loam	0-7	$4.2 \times 10^{-4} - 1.4 \times 10^{-3}$	[1]Severe: poor filter
	Clay, clay loam, gravelly clay loam	7-36	$1.4 \times 10^{-4} - 1.4 \times 10^{-3}$	
	Stratified sand to gravel	36-60	$>4.2 \times 10^{-3}$	
Uo	Urban land - Patton complex; silty clay loam	0-14	$4.2 \times 10^{-4} - 1.4 \times 10^{-3}$	[1]Severe: ponding, percolation slow
	Silty clay loam	14-37	$1.4 \times 10^{-4} - 1.4 \times 10^{-3}$	
	Stratified silt loam to silty clay loam	37-60	$1.4 \times 10^{-4} - 1.4 \times 10^{-3}$	

Note: 1 - Severe means that soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs and possibly increased maintenance are required.

Source: Lerch, et al., 1982

land complex underlies approximately 25 percent of the plant property. As previously stated most of the plant is covered with buildings, asphalt and/or concrete which greatly reduce the infiltration of precipitation into the subsurface. The South Fuel Farm which is underlain at depth by the more permeable Eldean-Urban land complex soil type (0-2 percent slope) has a clay base mixed with gravel. A membrane liner is planned for this diked area in the near future to act as a spill control measure and as an infiltration barrier.

SURFACE WATER RESOURCES

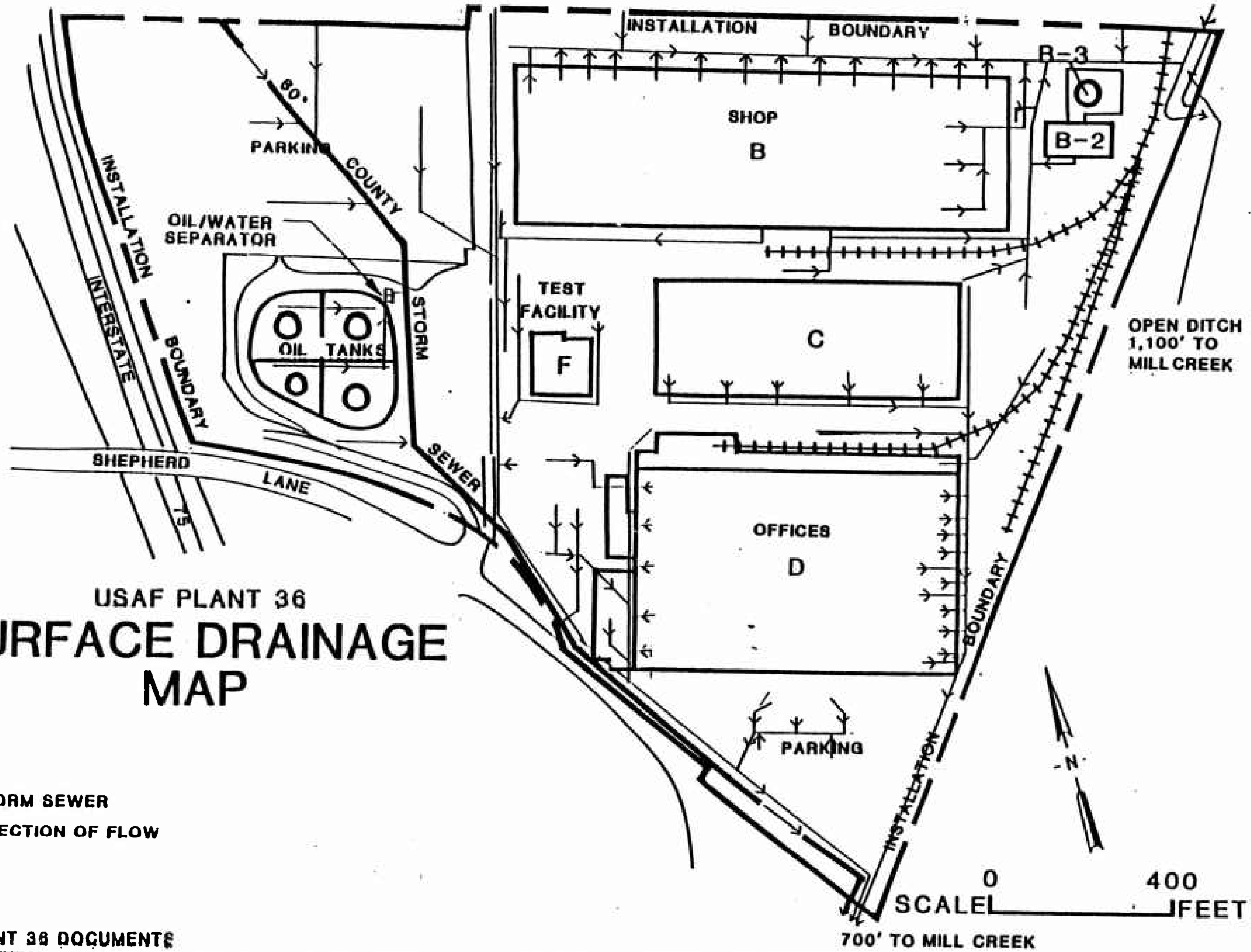
Plant 36 is located within the Mill Creek Basin (Ohio-Kentucky-Indiana Regional Council of Governments, [OKI], 1977). In the area of the plant the Mill Creek Basin is generally broad and flat. Near Reading, Ohio, just south of the plant, Mill Creek is approximately twenty feet wide and one-half foot deep. Mill Creek receives urban water runoff and industrial water discharges all along its course through Hamilton County.

Plant Drainage

Surface water drainage from Plant 36 is controlled by numerous storm sewer lines (Figure 3.3). Within the plant property there are three main drainage patterns. The major drainage pattern from Building B is east to the open ditch in the northeast corner of the property. The drainage pattern from Buildings C and D is southwest to the plant storm sewer lines in the southern corner of the plant property. The drainage pattern from the South Fuel Farm is northeast to an oil/water separator then east to the sixty-inch diameter county storm sewer which traverses the plant property from north to south.

Inflow to and outflow from the plant property are affected by external sources of storm water flow. Inflow to the plant occurs in five storm sewer lines along the northern plant property border with the General Electric Evendale Plant. Inflow also occurs in the open ditch in the northeast corner of the plant. A third source of inflow is from the sixty-inch diameter county storm sewer in the northern corner of the plant. Outflow from the plant is affected by potential sources of storm water along an open ditch which is located approximately 400 feet from the southern corner of the plant property (Figure 3.4). Possible storm

FIGURE 3.3

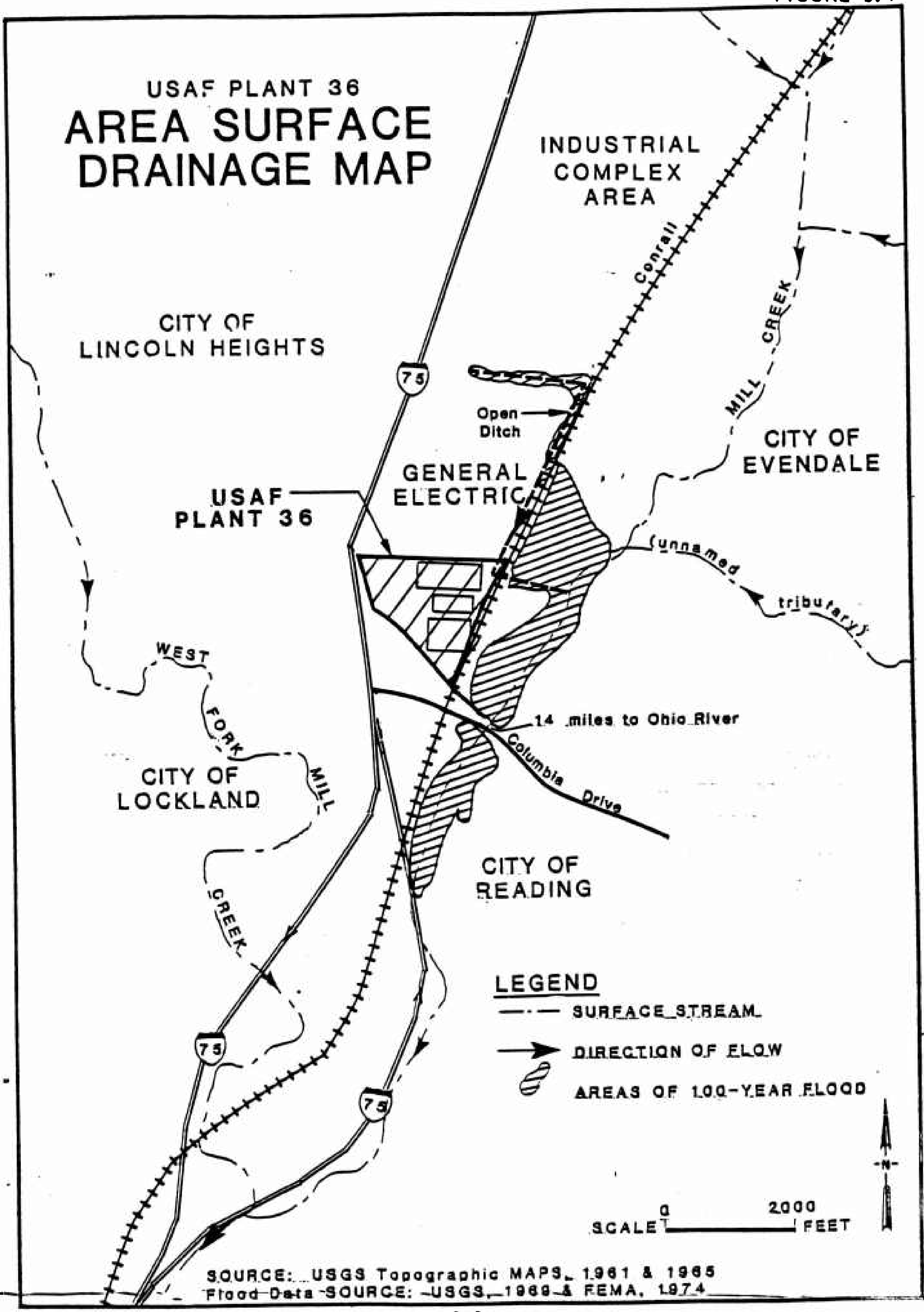


USAF PLANT 36
SURFACE DRAINAGE MAP

LEGEND
STORM SEWER
DIRECTION OF FLOW

SOURCE: PLANT 36 DOCUMENTS

FIGURE 3.4


USAF PLANT 36
AREA SURFACE DRAINAGE MAP
INDUSTRIAL COMPLEX AREA
Conrail
CITY OF LINCOLN HEIGHTS
75
MILL CREEK
Open Ditch
CITY OF EVENDALE
GENERAL ELECTRIC
USAF PLANT 36
(unnamed tributary)
WEST FORK MILL CREEK
14 miles to Ohio River
Columbia Drive
CITY OF LOCKLAND
CITY OF READING
LEGEND
SURFACE STREAM
DIRECTION OF FLOW
AREAS OF 100-YEAR FLOOD
N
SCALE 0 2000 FEET
SOURCE: USGS Topographic MAPS, 1961 & 1965
Flood Data SOURCE: USGS, 1969 & FEMA, 1974

water inflow to this open ditch from other industrial companies may affect the flow and water quality upstream of Plant 36.

Area Drainage

Area surface water drainage occurs in Mill Creek east of the plant (Figure 3.4). Upstream of the plant surface water flows south in an open ditch along the Conrail railroad. At the northeast corner of the plant the open ditch turns east and drains into Mill Creek. Upstream of this confluence Mill Creek receives water from four tributaries and numerous industrial and municipal storm water discharge points. Approximately two miles downstream of Plant 36 Mill Creek is joined by flow from the West Fork of Mill Creek and approximately fourteen miles downstream of Plant 36 Mill Creek empties into the Ohio River.

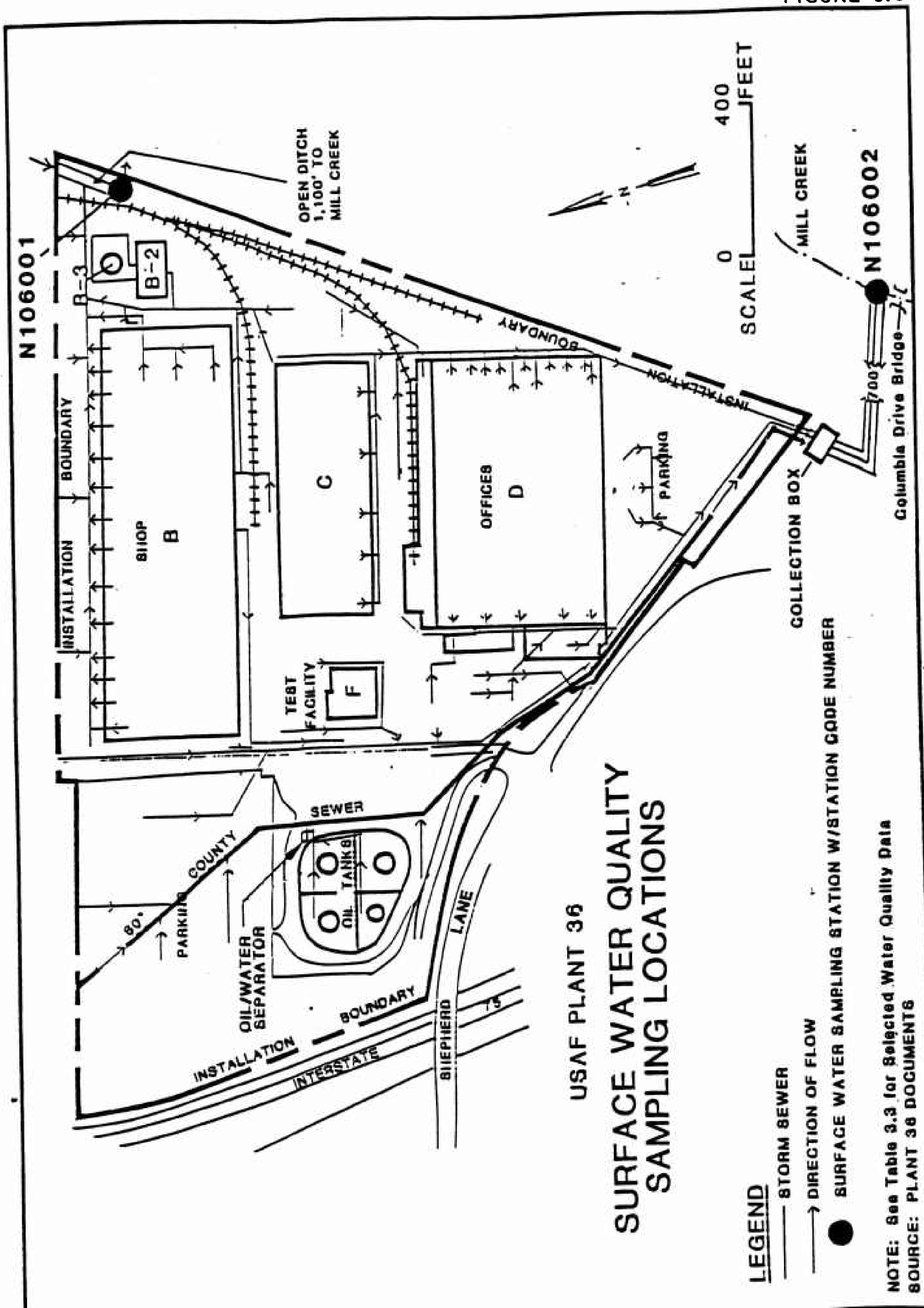
Flooding is a potential problem along Mill Creek east of Plant 36 but flood protection levees on the plant property protect the plant from flooding. The areas which may be affected by a 100-year flood are shown on Figure 3.4 according to maps of the Federal Emergency Management Agency (FEMA, 1974).

Surface Water Quality

The water quality of Mill Creek has been described as poor due to the urban development and numerous pollutant point sources along its course (OKI, 1977). Water quality parameters along Mill Creek which have been detected above state standards include fecal coliform bacteria, ammonia, phosphorus, phenols and metals such as barium, cadmium, iron, lead and selenium. Mill Creek has been classified as a Water Quality Limited Segment by the U.S. Environmental Protection Agency (OKI, 1977).

Water quality at Plant 36 is sampled at two locations (Figure 3.5). Station N106001 is located in the open ditch in the northeast corner of the property. An automatic sampler is installed at this station. Station N106002 is located at the Columbia Drive bridge approximately 700 feet southeast of the plant property. These two stations are permitted by the Ohio Environmental Protection Agency (Ohio EPA). Flow and water quality at these two stations may be affected by external sources beyond the control of Plant 36. These external sources may be the other industrial plants upstream of Plant 36 along the open ditch and along Mill Creek itself. Selected water quality data for these two stations

FIGURE 3.5



USAF PLANT 36

SURFACE WATER QUALITY SAMPLING LOCATIONS

NOTE: See Table 3.3 for Selected Water Quality Data
SOURCE: PLANT 36 DOCUMENTS

are presented in Table 3.3. The data indicate that oil and grease has been reported to be near the permit limit of 20 milligrams per liter (mg/l) per month, but both reported values of 19 mg/l were suspect, one due to lab error and the other was not retested for confirmation. At station N106001 on May 5, 1981 the following organics were detected (Source: Ohio EPA Documents):

Parameter	Concentration
Phenols	0.05 mg/l
1,1,1 Trichloroethane	61.2 micrograms per liter (ug/l)
Di-Butyl Phthalate	3.1 ug/l

No other sampling data for organic parameters has been reported. Due to the surface water inflow from other sources to the Plant 36 sampling station the exact source of the above organic parameters is unknown.

Surface Water Use

Surface water use of Mill Creek in the area of Plant 36 is limited to secondary contact recreational activities such as wading and canoeing. Mill Creek is not used as a public water supply source (OKI, 1977).

GROUND-WATER RESOURCES

The ground-water resources of the Plant 36 area have been reported by Bernhagen and Schaefer (1947), Bloyd (1974), Klaer and Thompson (1948), Schmidt (1959) and by the Ohio Water Commission (1961). Ground water is available from one primary aquifer and two secondary aquifers in the immediate vicinity of the plant. The primary aquifer is the confined lower Mill Creek Valley aquifer. The secondary aquifers are the unconfined upper Mill Creek Valley aquifer and the undifferentiated bedrock aquifers within the rocks outside the buried valley Alluvium and Outwash deposits (Schmidt, 1959).

Hydrogeologic Units

Geologically Plant 36 is located in the center of a buried glacial valley which has been filled with deposits of sand, gravel and clay. Figure 3.6 illustrates this valley where Alluvium and Outwash deposits

TABLE 3.3
SELECTED SURFACE WATER QUALITY DATA
FOR AIR FORCE PLANT 36

Sampling Station (See Figure 3.5 for Location)	Sampling Date (Mn/Dy/Yr)	pH [6.5-9.0] (su)	Total Organic Carbon (mg/l)	Flouride [1.8] (mg/l)	Oil & Grease [20*] (mg/l)	Iron, Total [1.0] (mg/l)	Arsenic [0.05] (mg/l)	Cadmium [0.010] (mg/l)	Chromium [0.05] (mg/l)	Lead [0.05] (mg/l)	Mercury [0.002] (mg/l)
N106001	2/ - /81 (monthly maximum)	7.5	NA	NA	[2] 19	NA	NA	NA	NA	NA	NA
N106001[1]	5/11/81	NR	0.08	0.18	5.42	0.5	0.0052	<0.0002	.006	<0.001	<0.0004
N106001	6/ - /82 (monthly maximum)	9.1	NA	NA	[3] 19	NA	NA	NA	NA	NA	NR
N106002	5/11/81	NR	0.21	0.19	6.0	1.0	NA	NA	NA	NA	NA

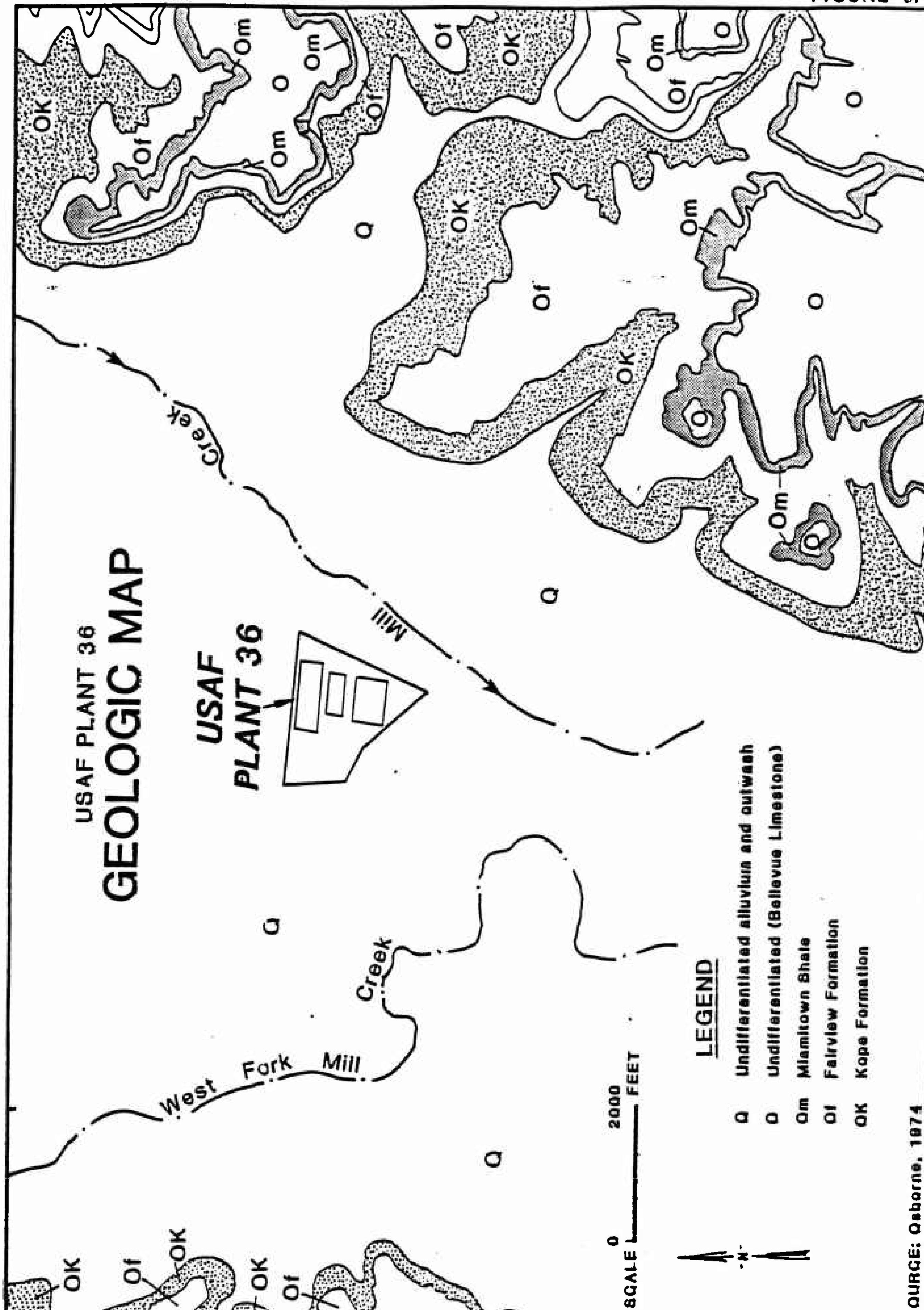
* Maximum permit discharge limit = 20 mg/l
Monthly average discharge limit = 15 mg/l

Notes: 1. See text for organic compounds detected in this sample.
2. Value is assumed to be a lab error.
3. Value not retested.
[ ] = Ohio EPA water quality limits

SU = standard units
mg/l = milligrams per liter
ug/l = micrograms per liter

Source: USAF Plant 36 Documents.

FIGURE 3.6



USAF PLANT 36
GEOLOGIC MAP
USAF
PLANT 36
Mill
Creek
West
Fork
Mill
Creek
Q
O
Om
Of
OK
SCALE
0
2000
FEET
N
LEGEND
Q Undifferentiated alluvium and outwash
O Undifferentiated (Bellevue Limestone)
Om Miamitown Shale
Of Fairview Formation
OK Kope Formation
SOURCE: Osborne, 1974

are exposed on the ground surface. On either side of this valley consolidated rocks of shale and limestone are exposed at the ground surface. Table 3.4 summarizes the hydrogeologic units and their water-bearing characteristics. Well yields from the confined lower Mill Creek Valley aquifer may be as much as 1,000 gallons per minute (gpm) whereas well yields from the upper Mill Creek Valley aquifer and the undifferentiated bedrock aquifers may be as low as 5 to 10 gpm.

The lower aquifer within the Mill Creek Valley contains sand and gravel deposits approximately 150 feet thick. Figure 3.7 illustrates the stratification which is typical of the valley deposits. The well log in Figure 3.7 is from General Electric Well No. 5 which is approximately 3,000 feet north of Plant 36. The stratification underlying Plant 36 is assumed to be similar.

The upper aquifer within the Mill Creek Valley contains sand, silty sand, gravel and clay. Figure 3.8 illustrates the location of a hydrogeologic cross section of Plant 36. Figure 3.9 illustrates the variation in lithology from a predominantly clay sequence underlying Building B to a predominantly sand sequence underlying Building C. No soil boring data were available for the area of Building D.

Ground-Water Hydrology

Hydrologically, Plant 36 is located in an area of limited recharge to the lower Mill Creek Valley aquifer. A clay layer approximately 20 feet thick exists under the plant in the areas of Building B and C. This clay layer limits the recharge by precipitation, upper aquifer water and Mill Creek infiltration water into the lower aquifer. The existence and limited recharge capabilities of this clay layer have been reported to be predominantly in areas south of Lockland (Schmidt, 1959). Lockland is approximately one mile south of Plant 36. Approximately two miles north of Lockland the upper and lower aquifers are reported to be hydraulically connected and therefore direct vertical recharge may occur. Plant 36 is north of Lockland but yet is still underlain by two aquifer systems. Other facts indicating the aquifer separation are water level comparisons in the immediate vicinity of the plant. In 1951 the shallow soil boring (40 feet deep) water levels after boring completion varied between three and ten feet deep, whereas General Electric Well No. 3A (183 feet deep) completed also in 1951 displayed a water

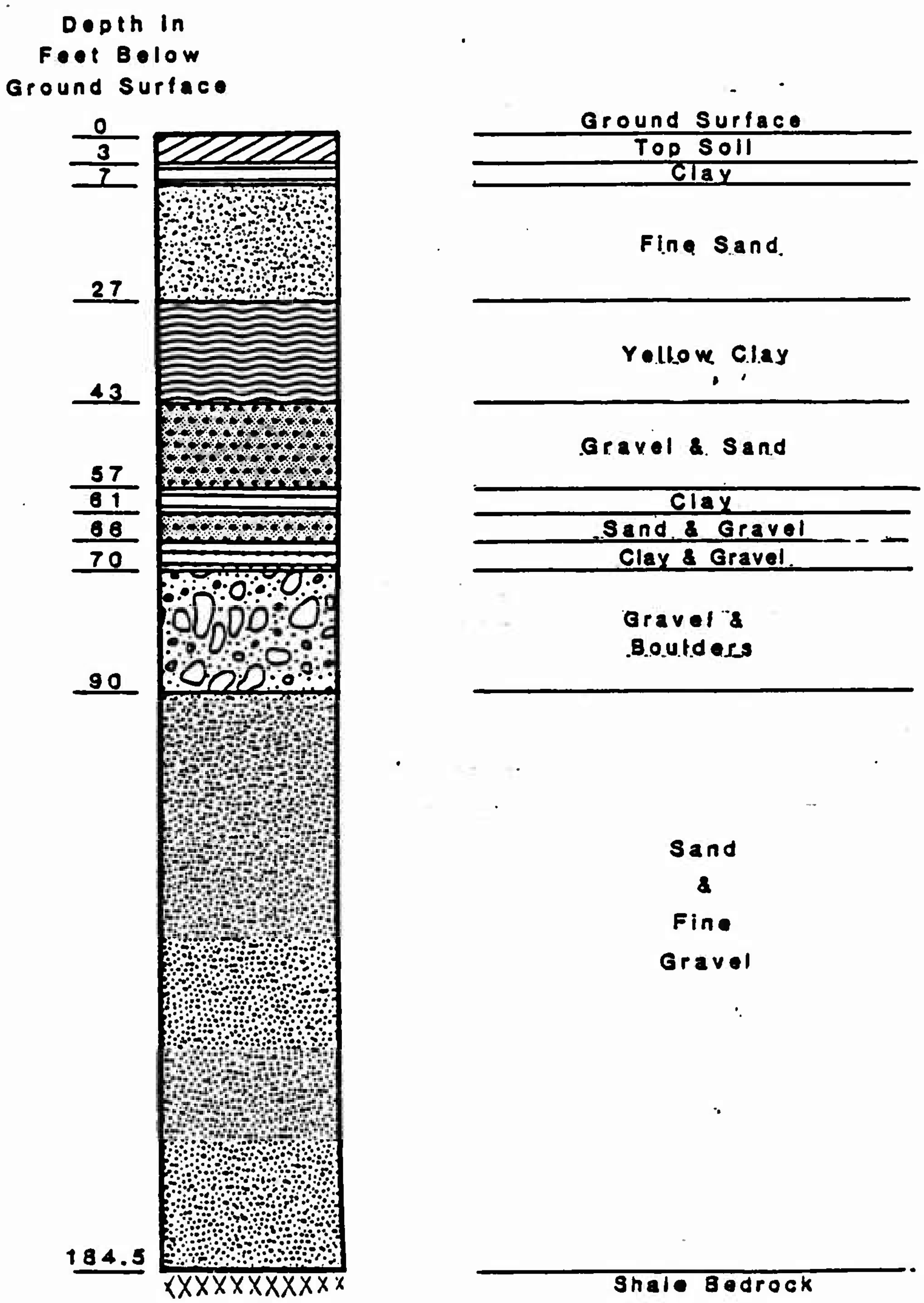
TABLE 3.4
HYDROGEOLOGIC UNITS AND THEIR WATER-BEARING
CHARACTERISTICS IN THE VICINITY OF PLANT 36

System	Series	Hydrogeologic Unit	Hydrogeologic Classification	Approximate Thickness (feet)	Dominant Lithology	Water-Bearing Characteristics
Quaternary	Recent and Pleistocene	Undifferentiated Alluvium and Outwash	Upper Unconfined Aquifer	20	Sand, silty sand, gravel and clay	Readily transmits water. Well yields are generally less than 10 gpm.
			Lower Confined Aquifer	150	Sand and gravel	Readily transmits water. Well yields may be as much 1,000 gpm.
Ordovician	Upper Ordovician (Cincinnatian)	Undifferentiated (Bellevue Limestone and overlying rocks)	Limited Confined Aquifer	12	Limestone with mudstone	Does not readily transmit water. Well yields may be less than 5 gpm.
		Miamitown Shale	Confining Bed	12	Shale	Does not readily transmit water.
		Fairview Formation	Limited Confined Aquifer	70-110	Shale and Limestone	Does not readily transmit water. Well yields may be less than 5 gpm.
		Kope Formation	Limited Confined Aquifer	67-100	Shale and Limestone	Does not readily transmit water. Well yields may be less than 5 gpm.

Source: Schmidt (1959) and Osborne (1974).

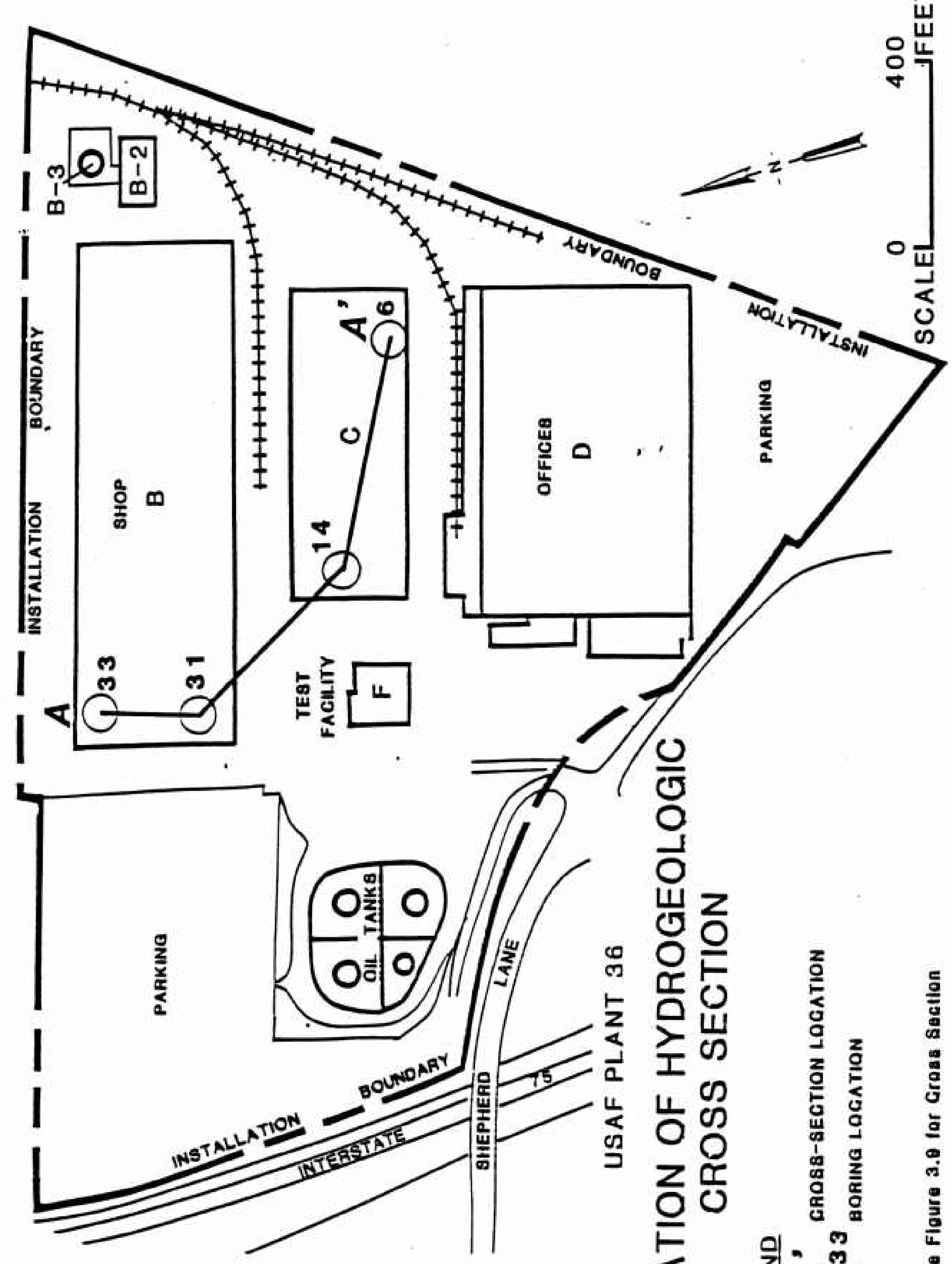
USAF PLANT 36

GE WELL LOG NO. 5



NOTE: See Figure 3.10 for well location.

SOURCE: USAF PLANT 36 DOCUMENTS



LOCATION OF HYDROGEOLOGIC CROSS SECTION

LEGEND

A-A' CROSS-SECTION LOCATION

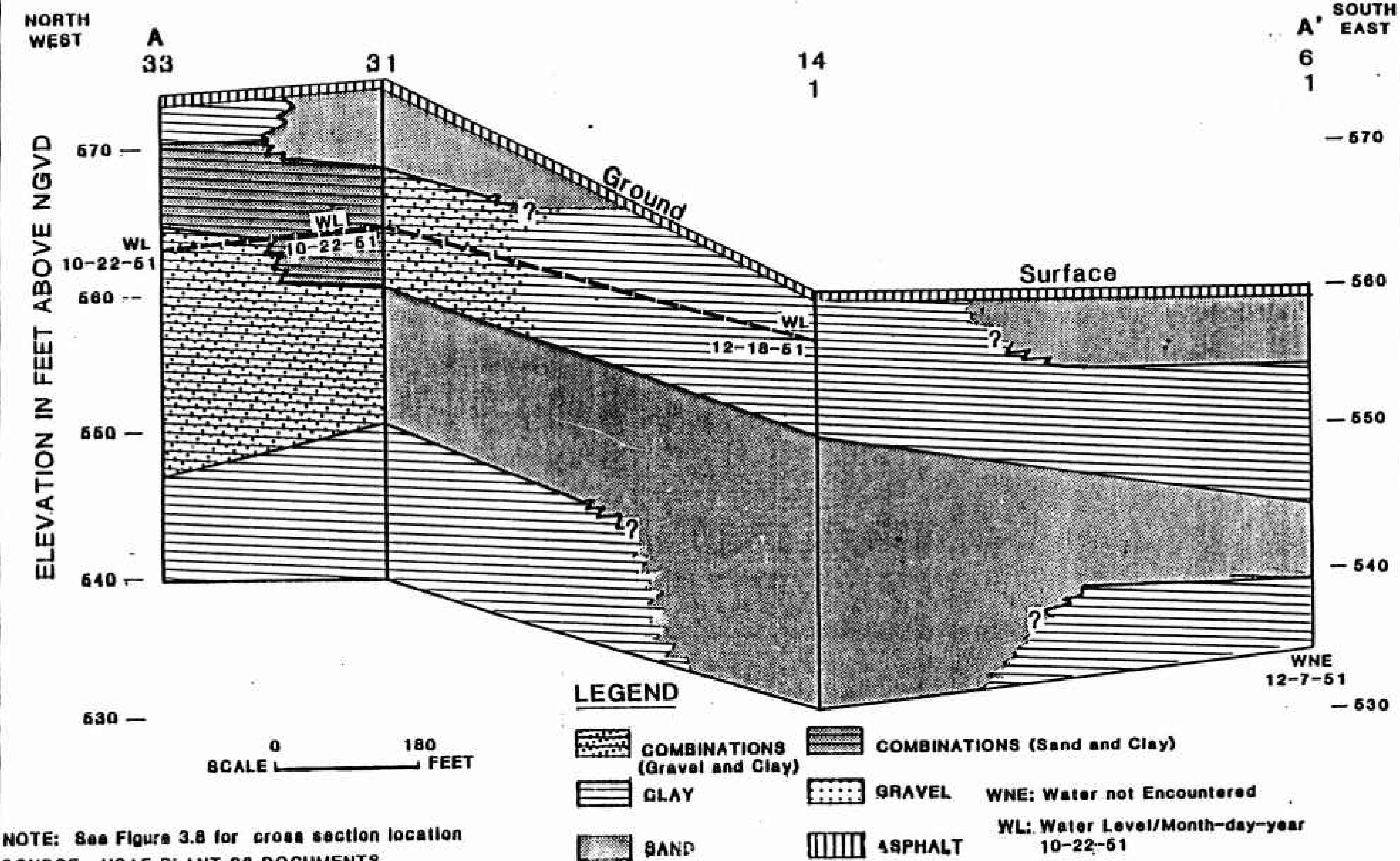
33 BORING LOCATION

NOTE: See Figure 3.9 for Cross Section

SOURCE: USAF PLANT 36 DOCUMENTS

USAF PLANT 36

HYDROGEOLOGIC CROSS SECTION A–A′



NOTE: See Figure 3.8 for cross section location
SOURCE: USAF PLANT 36 DOCUMENTS

level of 56 feet. The differences in water levels indicate the lack of a hydraulic connection between the upper and lower aquifers.

Water levels within the lower aquifer in the immediate vicinity of Plant 36 have generally risen back to their 1941 level of 56 feet below land surface after being at a low of 105 feet below land surface in 1969. General Electric uses its wells as a source of industrial water. Drinking water is purchased from the Southwestern Ohio Water Company whose wells are located thirteen miles west of Plant 36 in the Miami River Valley. Miami River Valley ground water is a more reliable source.

The ground-water flow directions within the upper and lower aquifers of the Mill Creek Valley have not been well documented. The flow direction within the upper aquifer is assumed to be southeast in the immediate vicinity of Plant 36. The exact flow direction within the lower aquifer is unknown, but is assumed to be south to south-east. Localized flow directions will be affected by nearby wells such as those for the City of Reading east of Plant 36 and the City of Wyoming south-west of Plant 36. The closest impact on ground-water flow in the lower aquifer at Plant 36 may be the five wells utilized by the City of Reading approximately 1,000 feet east of the plant.

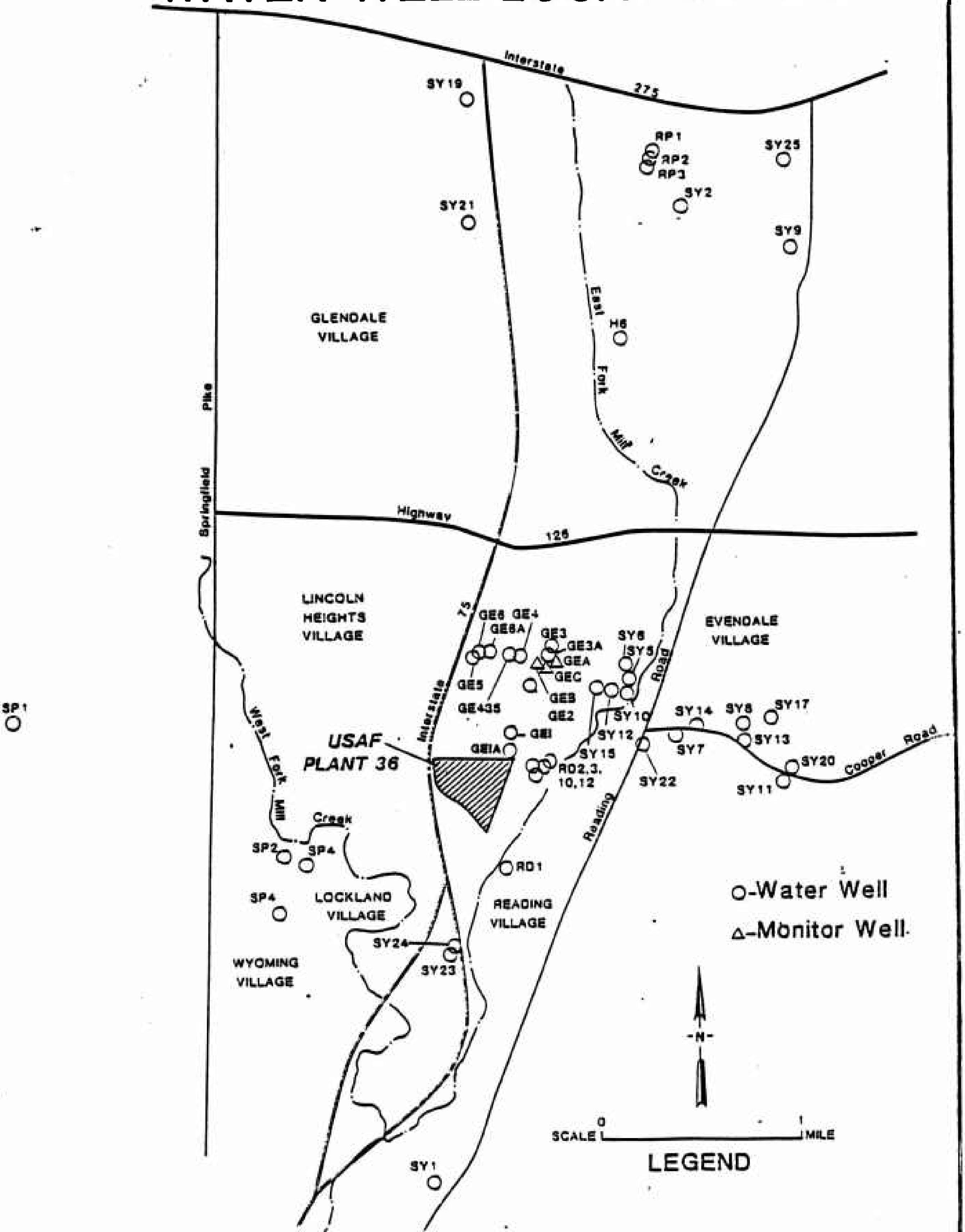
Ground-Water Quality

The ground-water quality in the Mill Creek Valley is described as good to fair. Hardness and iron are reported to be two objectionable water qualities (Ohio Department of Natural Resources [ODNR], 1976). Total dissolved solids generally range from 300 to 450 mg/l and iron usually ranges from 0.5 to 1.5 mg/l. There have been isolated occurrences of low levels of organic contaminants within wells tapping the lower valley aquifer in the vicinity of Plant 36. The sources of these contaminants have not been identified.

Ground-Water Use

Ground-water public supply use in the vicinity of Plant 36 is limited to two municipal well fields, one utilized by the City of Wyoming and one by the City of Reading. Localized ground-water usage is limited to selected industries and homes generally north and east of Plant 36. Figure 3.10 is a water well location map of the area and Table 3.5 summarizes selected data for each well.

USAF PLANT 36
WATER WELL LOCATION MAP



NOTE: See Table 3.5 for Well Data

SOURCE: USAF PLANT 36 DOCUMENTS USGS, 1984 OHIO DNR DOCUMENTS
OHIO WATER COMMISSION HEARING, 1961

TABLE 3.5
WATER WELL DATA FOR USAF PLANT 36 AND VICINITY

Symbol on Figure 3.10	Owner	Depth (feet) Casing	Depth (feet) Screen	Depth (feet) Total	Diameter (inches)	Hydrogeologic Unit Tapped By Well	Water Level Below Ground Surface (feet)	Yield (gpm)	Use
GE A	General Electric, Evendale	23.5	10	33.5	4	Q	NR	NR	M
GE B	General Electric, Evendale	35	10	45	4	Q	27.4	NR	M
GE C	General Electric, Evendale	36.5	10	46.5	4	Q	NR	NR	M
GE 1	General Electric, Evendale	148	20	168	26	Q	56	1,000	NIU
GE 2	General Electric, Evendale	156	20	176	26	Q	50	1,000	I
GE 3	General Electric, Evendale	158	20	178	26	Q	46	1,000	A
GE 3A	General Electric, Evendale	138	45	183	16	Q	56.6	1,000	I
GE 4	General Electric, Evendale	157	20	177	26	Q	49	1,000	I
GE 5	General Electric, Evendale	164	20	184	26	Q	53	1,000	I
GE 6	General Electric, Evendale	148	20	168	26	Q	77	1,000	A
GE 6A	General Electric, Evendale	125	45	170	16	Q	70	1,000	I
GE 435	General Electric, Evendale	147	35	182	20	Q	97	1,000	O
GE 1A	General Electric, Evendale	148.5	30	178.5	16	Q	105.6	1,000	I

TABLE 3.5
WATER WELL DATA FOR USAF PLANT 36 AND VICINITY
(Continued)

Symbol on Figure 3.10	Owner	Depth (feet) Casing	Depth (feet) Screen	Depth (feet) Total	Diameter (inches)	Hydrogeologic Unit Tapped By Well	Water Level Below Ground Surface (feet)	Yield (gpm)	Use
H 6	Glendale Water Dept., Glendale	167	NR	NR	8	Q	44.6	NR	M
RD 1	City of Reading	131	20	151	12	Q	107	250	PS
RD 2	City of Reading	154	21.2	175.2	8	Q	93	225	PS
RD 3	City of Reading	155	21.7	176.7	12	Q	97	550	PS
RD 10	City of Reading	152.6	20	172.6	12	Q	99	400	PS
RD 12	City of Reading	144.2	20.5	164.7	12	Q	96	350	PS
RP 1	Ralston Purina Co., Sharonville	173.5	30	203.5	10	Q	48	350	I
RP 2	Ralston Purina Co., Sharonville	174	30	204	10	Q	48	350	I
SP 1	J. Stohlman, St. Bernard	35.6	NA (open hole)	59	6	R	16	NR	D
SP 2	City of Wyoming	164	30	194	16	Q	132	500	PS
SP 3	Wyoming Country Club	157	20	177	12	Q	NR	500	PS
SP 4	City of Wyoming	160	35	195	16	Q	137.9	508	PS
SY 1	Carrousel Inn, Cincinnati	145	20	165	10	Q	80	228	PS
SY 2	City of Lockland	199	25	224	12	Q	60	367	PS
SY 3	Formica Corporation	122	43	165	12	Q	74	500	I
SY 4	City of Wyoming	192	NA	192	6	NA	NR	NR	NIU
SY 5	Formica Corporation	151	40	191	12	Q	101	400	I
SY 6	Formica Corporation	151	30	181	12	Q	102	620	I

TABLE 3.5
WATER WELL DATA FOR USAF PLANT 36 AND VICINITY
(Continued)

Symbol on Figure 3.10	Owner	Depth (feet) Casing	Screen	Total	Diameter (inches)	Hydrogeologic Unit Tapped By Well	Water Level Below Ground Surface (feet)	Yield (gpm)	Use
SY 7	George Dugger	85	NR	NR	6	Q	NR	NR	D
SY 8	D. Ziccardi	43	NA (open hole)	100	6	R	36	1.5	D
SY 9	City of Lockland	175	25	200	12	Q	36	550	PS
SY 10	American Cyanamid	127	40	167	12	Q	89	600	I
SY 11	Gillis Wilder	59	NA (open hole)	70	6	R	NR	NR	D
SY 12	American Cyanamid	141	35	176	12	Q	85	600	I
SY 13	Vanderhaar Bros.	52	10	62	6	Q	19	NR	D
SY 14	Al Janney	35	NA (open hole)	76	6	R	40	NR	D
SY 15	Formica Corporation	181.5	20	201.5	12	Q	106	495	I
SY 16	Liquid Carbonic Corporation	141	20	161	8	Q	110	60	I
SY 17	R. L. Trammel, Sr.	26.5	NA (open hole)	75	6	R	30	1.5	D
SY 19	Ralph Martin	88	NR	NR	6	Q	NR	NR	D
SY 20	J. P. Huddleston	12	NA (open hole)	100	5	R	NR	0.75	D
SY 21	S. J. Pettett	41	NA (open hole)	45	6	R	NR	NR	D

TABLE 3.5
WATER WELL DATA FOR USAF PLANT 36 AND VICINITY
(Continued)

Symbol on Figure 3.10	Owner	Depth (feet) Casing	Depth (feet) Screen	Depth (feet) Total	Diameter (inches)	Hydrogeologic Unit Tapped By Well	Water Level Below Ground Surface (feet)	Yield (gpm)	Use
SY 22	Oscar Johnston	44	NA (open hole)	75	6	R	40	NR	D
SY 23	Sawbrook Steel Castings Co.	154	21.5	175.5	12	Q	81	454	I
SY 24	Sawbrook Steel Castings Co.	154	21	175	8	Q	110	250	I
SY 25	Tool Steel, Gear and Pinion Co.	NR	NR	178	NR	Q	68	190	I

Notes: D = Domestic
gpm = Gallons Per Minute
I = Industrial
M = Monitor
NA = Not Applicable
*A = Abandoned
NIU = Not In Use
NR = Not Recorded
PS = Public Supply
Q = Undifferentiated Alluvium and Outwash
R = Consolidated Rock Formation
O = Observation

* As per Ohio State Regulations.

GE = General Electric
RD = Reading
RP = Ralston Purina
SP = Springfield Township
SY = Sycamore Township

Source: USAF Plant 36 Documents; USGS, 1984; Ohio DNR Documents; Ohio Water Commission Hearing, 1961.

The General Electric Evendale Plant, adjacent to Plant 36, uses on-site wells as an industrial water supply. The City of Reading is the closest and largest single user of ground water within the immediate vicinity of Plant 36.

BIOTIC ENVIRONMENT

Since Plant 36 is an industrial complex no significant wildlife exists on the plant property. There are no federally-listed or state-listed endangered or threatened species on Plant 36.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data for Plant 36 indicate the following data are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 40.59 inches; the net precipitation is +6.59 inches and the 1-year 24-hour rainfall event is 2.5 inches. These data indicate an abundance of rainfall in excess of evaporation (a mean precipitation driving force) which causes a potential for storms to create excessive runoff.
2. The top three feet of soil underlying the plant generally consists of clay and clay loam with moderate permeabilities. A majority of the plant is covered with buildings, asphalt or concrete. Grass and open soil areas are very limited; therefore infiltration will likewise be limited and slow through the clay.
3. A shallow water table aquifer exists approximately 3 to 10 feet deep under most of the plant. This upper Mill Creek Valley aquifer is not utilized as a ground-water source in the vicinity of the plant.
4. A clay confining unit exists under the plant which separates the upper and lower Mill Creek Valley aquifers. This clay may not be continuous beneath the plant.
5. A deeper confined aquifer exists approximately 50 feet deep under the plant. This lower Mill Creek Valley aquifer is utilized as a ground-water source in the vicinity of the plant.

6. Plant 36 discharges storm water runoff to Mill Creek approximately 1,000 feet east of the Plant. Mill Creek is a Water Quality Limited stream due to numerous urban and industrial discharges both north and south of Plant 36.

7. There are no federally-listed or state-listed endangered or threatened species on Plant 36.

SECTION 4
FINDINGS

This section summarizes the hazardous wastes generated by installation activities, identifies hazardous waste accumulation and disposal sites located on the Air Force Plant 36 site, and evaluates the potential environmental contamination from hazardous waste sites. Past waste generation and disposal methods were reviewed to assess hazardous waste management practices at Air Force Plant 36.

INSTALLATION HAZARDOUS WASTE ACTIVITY REVIEW

A review was made of past and present installation activities that resulted in generation, accumulation and disposal of hazardous wastes. Information was obtained from files and records, interviews with installation employees and site inspections.

The sources of hazardous waste at Air Force Plant 36 are grouped into the following categories:

- o Industrial Operations (Shops)
- o Fire Protection Training
- o Fuels Management
- o Spills and Leaks
- o Waste Storage Areas
- o Raw Materials Storage Areas
- o Pesticide Utilization

The subsequent discussion addresses only those wastes generated at Air Force Plant 36 which are either hazardous or potentially hazardous. Potentially hazardous wastes are grouped with and referenced as "hazardous wastes" throughout this report. A hazardous waste, for this report, is defined by, but not limited to, The Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response,

Compensation and Liability Act of 1980 (CERCLA). Compounds such as polychlorinated biphenyls (PCB's) which are listed in the Toxic Substances Control Act (TSCA) are also considered hazardous. For study purposes, waste petroleum products such as contaminated fuels, waste oils and waste nonchlorinated solvents are also included in the "hazardous waste" category.

No distinction is made in this report between "hazardous substances/materials" and "hazardous wastes". A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the material.

Industrial Operations (Shops)

Summaries of industrial operations at Air Force Plant 36 were developed from installation files and interviews. Information obtained was used to determine which operations handle hazardous materials and which ones generate hazardous wastes.

The wastes generated from the present industrial operations were used as a starting point for defining the past waste generation and waste management practices at the plant which have had changes over the life of the plant. Past waste generation quantities are in general commensurate with present levels. General Electric does not separate most wastes by Plant 36/General Electric property, making separate estimation of Plant 36/General Electric waste generation difficult. The plants are contiguous and some work is shared (e.g., engine test cells operate both on Plant 36 property and on General Electric property). From this review a list was developed that contains the facility name and number, the location, hazardous material handlers, hazardous waste generators, and typical treatment, storage, and disposal methods. This list is presented in Appendix C, Master List of Shops.

Those shops which were determined to be generators of hazardous waste were selected for further investigation and evaluation. During the site visit, interviews were conducted with personnel specifically familiar with these shop operations and waste generation. These interviews focused on hazardous waste generation, waste quantities, and methods of storage, treatment, and disposal of hazardous waste. Historical information was obtained primarily from interviews with various employees. Table 4.1 summarizes the information obtained from the

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
AIRCRAFT ENGINE BUSINESS GROUP (AEBG)				
PLATING LINE	C-EAST	WASTE SULFURIC ACID FROM CLEANING TANK	500 GALS./YR.	NEUTRALIZED/DISCHARGED TO MSD 1965 1972
BONDERITE FACILITY	C-EAST	WASTE PHOSPHORIC ACID CONTAINING ZINC	500 GALS./YR.	NEUTRALIZED/DISCHARGED TO MSD 1959 1965
WINGTIP PAINT BOOTHS	C-EAST	PAINT SLUDGE	100 GALS./YR.	OFF-SITE CONTRACTOR
		PAINT OVERSPRAY (DRY)	100 GALS./YR.	OFF-SITE CONTRACTOR 1976
BONDERITE PAINT BOOTHS	C-EAST	PAINT SLUDGE	100 GALS./YR.	OFF-SITE CONTRACTOR 1959
GRINDING/DEBURRING SHOP	C-EAST	METAL GRINDINGS	500 LBS./YR.	OFF-SITE CONTRACTOR 1981
HOLLOW BLADE FACILITY ELECTRO-STREAM DRILLING SHOP	B	WASTE SUFURIC ACID	100 GALS./YR.	NEUTRALIZED/DISCHARGED TO MSD 1966 1969
J-47 ENGINE OVERHAUL PLATING AREA	B	CAUSTIC SODA BATH	2,000 GALS./YR.	NEUTRALIZED/DISCHARGED TO MSD 1955 1965
		CHROMATE-PHOSPHORIC ACID BATH	2,000 GALS./YR.	Cr REDUCTION/DISCHARGED TO MSD
ENGINE ASSEMBLY AREA	B	WASTE JP-5	1,000 GALS./YR.	OIL-WATER SEPARATOR TO OFF-SITE CONTRACTOR 1967 1969
PLASMA SPRAY	B	METALS SLUDGE	500 GALS./YR.	OFF-SITE CONTRACTOR 1960 1966
LABORATORY	B	WASTE CHEMICALS	100 GALS./YR.	OFF-SITE CONTRACTOR

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

NOTE: MSD= METROPOLITAN SEWER DISTRICT

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
THRUST REVERSER MANUFACTURING SHOP	B	CHROMATE-PHOSPHORIC ACID BATH	2,000 GALS./YR.	Cr REDUCTION, DISCHARGED TO MSD 1960 – 1966
ENGINE TEST CELLS	B	WASTE JP-5/JETA/OIL MIXTURE	50 GALS./DAY	OIL-WATER SEPARATOR; OIL PHASE TO OFF-SITE CONTRACTOR 1955 →
COOLING TOWER WATER	B	BIOCIDE, DILUTED	3 LB./DAY	1982 → DISCHARGED TO MSD
ADVANCED ENERGY PROGRAM DEVELOPMENT (AEPD)				
CLEANING AND PLATING SHOP	D	WASTE ACID FROM CLEANING TANK	10 GALS./YR.	NEUTRALIZED/DISCHARGED TO MSD 1954 – 1969
		WASTE CAUSTIC FROM CLEANING TANK	10 GALS./YR.	NEUTRALIZED/DISCHARGED TO MSD
		CYANIDE WASTE	10 GALS./YR.	OFF-SITE CONTRACTOR
CLEANING LINE	D	CHROMATE BATH	20 GALS./YR.	DILUTED AND DISCHARGED TO MSD (1957-58); OFF-SITE CONTRACTOR (1959-64) 1957 – 1964
RHODINE LEACH PROCESS	D	HYDROFLUORIC ACID WASTE	15 GALS./YR.	NEUTRALIZED/WATER EVAPORATED, SOLID SALT DISPOSED BY OFF-SITE CONTRACTOR 1972 – 1983
MACHINE SHOP	D	1,1,1,-TRICHLOROETHANE DEGREASER	200 GALS./YR.	1951 OFF-SITE CONTRACTOR →
		MACHINE OIL	550 GALS./YR.	OFF-SITE CONTRACTOR →
LABORATORIES	D	LAB CHEMICALS	200 LBS./YR.	1955 OFF-SITE CONTRACTOR →
NUCLEAR SYSTEMS SHOPS	D,C-WEST	RADIOACTIVE WASTE SOLIDS	100,000 LBS./YR.	1951 OFF-SITE CONTRACTOR 1970
		EXHAUST (CWS) FILTERS	2,500 LBS./YR.	OFF-SITE CONTRACTOR 1974

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

NOTE: MSD= METROPOLITAN SEWER DISTRICT

detailed shop reviews including information on shop location, identification of hazardous or potentially hazardous wastes, present waste quantities, and treatment, storage, and disposal timelines. Changes in the treatment, storage and disposal methods are noted on the table.

Industrial wastes generated at Air Force Plant 36 have been associated with the two General Electric Company groups which are in operation on the property, namely the Aircraft Engine Business Group (AEBG) and Advanced Energy Programs Development (AEPD) and its predecessor organizations. In Appendix C and Table 4.1 the shop operations are delineated by those two organization names.

Shop operations associated with AEPD have performed metal cleaning and plating, metal etching, machining and grinding operations, and laboratory operations involving low-level radioactive materials. Shop operations associated with AEBG have performed engine test activities, metal processing and grinding/sanding.

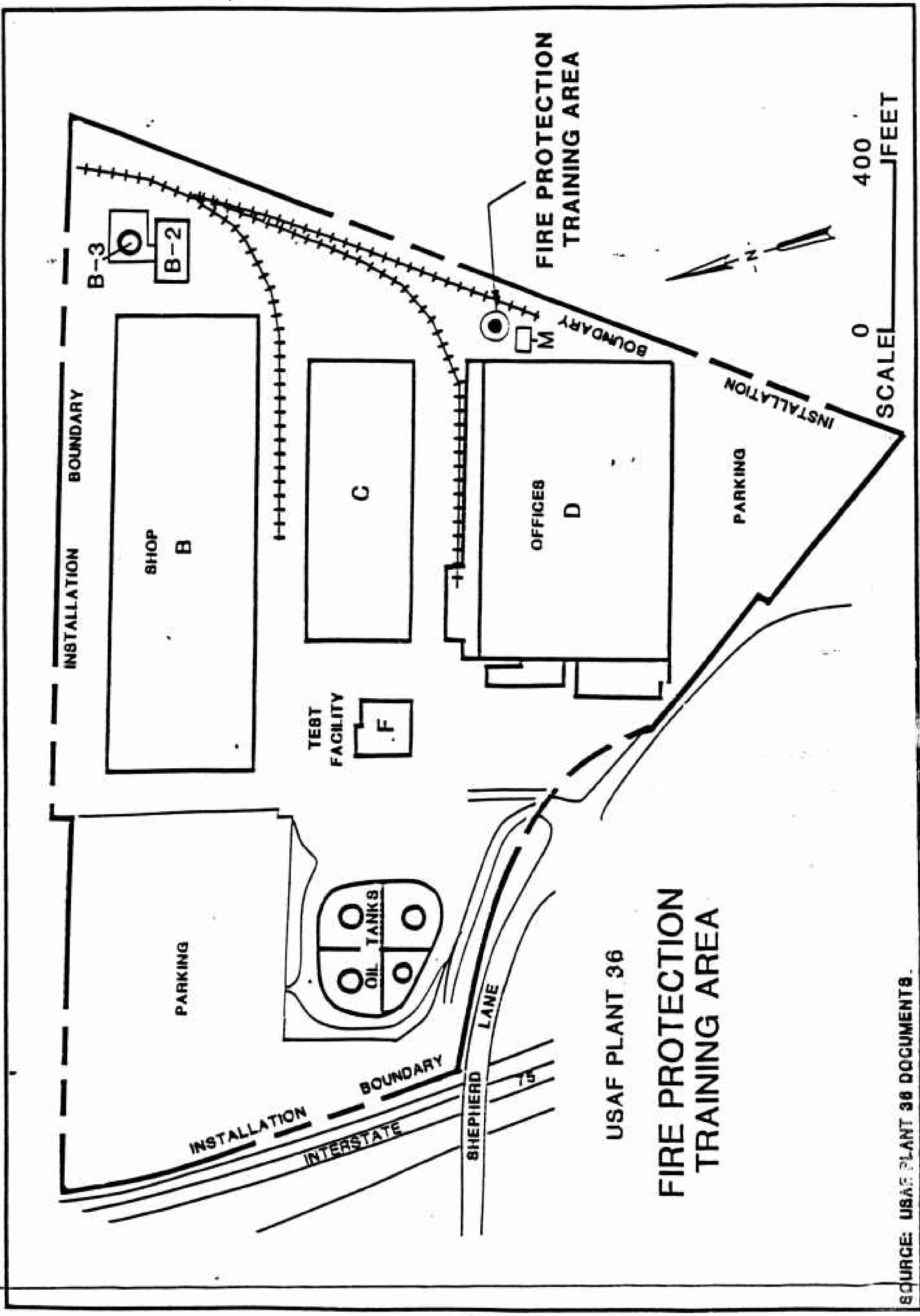
Fire Protection Training

Fire protection training activities at Air Force Plant 36 were performed at the eastern edge of the plant property north of Building M (see Figure 4.1) from about 1953 until 1969. At this site, which was on a concrete area, a solid metal pan of approximate dimensions six feet square and six inches deep was used for training exercises. A volume of uncontaminated JP-5 estimated at 10 gallons was poured from two five-gallon metal containers into the pan and ignited. Extinguishing agents employed in training exercises were carbon dioxide and dry chemical (Purple K). Interviewers reported that the pan routinely was burned dry and no waste discharge was reported. Fire protection training activities were discontinued on Plant 36 property in 1969.

During the 1950's and 1960's a fire engine was housed on the plant property in Building D-6. Since the 1960's all fire equipment has been housed at the adjacent G.E. Evendale plant. At present fire extinguishing supplies are stored in Building D-6.

Because of the nature of the activities in the fire training area and the nature of their containment, no potential for environmental contamination is associated with this site.

FIGURE 4.1



USAF PLANT 36
FIRE PROTECTION
TRAINING AREA

SOURCE: USAF PLANT 36 DOCUMENTS.

Fuels Management

Fuels used at Air Force Plant 36 consist of JP-5, #2 fuel oil, and diesel fuel. The JP-5 fuel is used in testing production engines manufactured at the Evendale plant. In addition, #2 fuel oil is stored on Plant 36 property as reserve fuel for the boiler house (Building 421 on the G.E. Evendale plant property); diesel fuel is used in testing some turbine engines. Table 4.2 provides a summary of above ground fuel storage tanks on Plant 36 property. The four tanks in the Building T-South Fuel Farm area are above ground tanks situated on a clay-gravel base with concrete dikes surrounding each tank for spill containment purposes.

Fuel is transported onto the plant site by truck; fuel is not transported across plant bounderies by pipelines. Fuel to be used in aircraft engine testing is at present piped from the South Fuel Farm to the test cells by above ground piping.

Underground tanks on Plant 36 property are listed and described in Table 4.3 and shown on Figure 4.2. Two underground tanks are known to be in current service; Tank BB1 contains slush oil and Tank BB2 contains diesel fuel.

Two spills of fuel have been reported in plant records and by interviews with plant personnel. These spills are discussed further in the spills and leaks portion of this section.

Spills and Leaks

Three spills of hazardous or potentially hazardous materials have been reported at Air Force Plant 36. The first spill, which was in 1972, occurred adjacent to the filter building (Building U) west of the engine test cells in Building B (see Figure 4.3). At that time a series of underground pipes transferred JP-5 fuel from the South Fuel Farm to the filter building (Building U); filtered fuel was then transported by above ground pipes to the Building B test cells. The spill was caused by a break in an underground JP-5 fuel line within six feet of the Building U entrance. The spill quantity was unknown but was estimated to be 1,000 gallons. Visibly contaminated earth associated with the spill was removed from the plant site and disposed by an off-site contractor. No soil sampling or ground-water monitoring was performed at

TABLE 4.2
FUEL MANAGEMENT SYSTEM ABOVE GROUND TANK INVENTORY

Building	Contents	Capacity (gal.)	Construction Date
T (South Fuel Farm)	JP-5	535,000	1951
T (South Fuel Farm)	JP-5	535,000	1951
T (South Fuel Farm)	JP-5	535,000	1951
T (South Fuel Farm)	#2 Fuel Oil	250,000	1951

TABLE 4.3
LIST OF UNDERGROUND TANKS

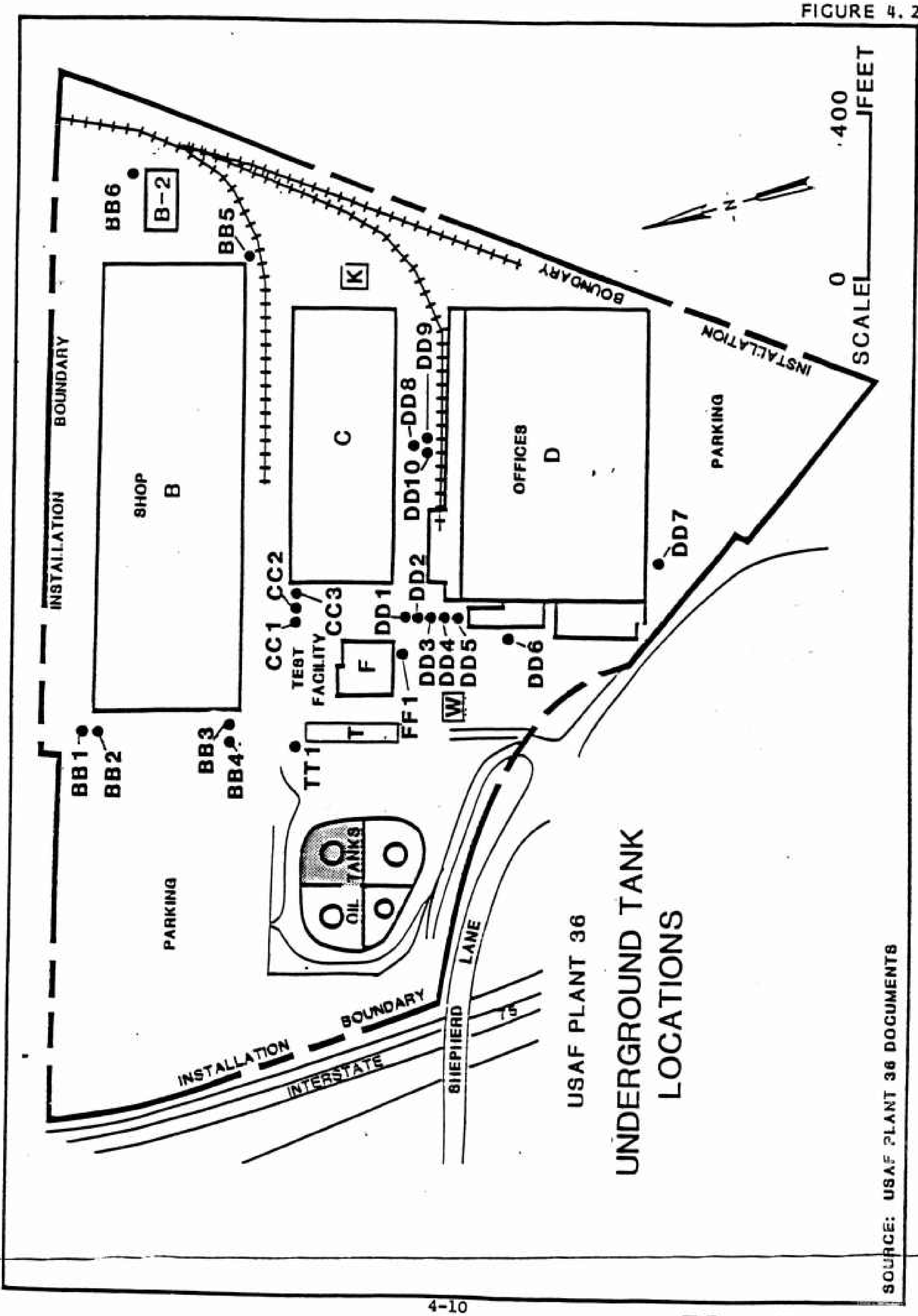
Tank Desig.	Year Installed	Year Abandoned	Tank Cap. Gals.	Material of Construction	External Protection	Internal Protection	Contents
BB1	1951	In Service	30,000	Steel	Unknown	Unknown	Slush Oil
BB2	1951	In Service	30,000	Steel	Unknown	Unknown	Diesel
BB3	1951	Unknown	20,000	Steel	Unknown	Unknown	Water
BB4	1951	Unknown	20,000	Steel	Unknown	Unknown	Water
BB5	1942	1970(?)	1,000	Steel	Unknown	Unknown	Water
BB6	1942(?)	1945(?)	300(?)	Steel	Unknown	Unknown	Unknown-A
CC1	1941	Unknown	20,000	Steel	Unknown	Unknown	Water
CC2	1941	Unknown	20,000	Steel	Unknown	Unknown	Unknown
CC3	1941	Unknown	15,000	Steel	Unknown	Unknown	Unknown
DD1	1952	1968	20,000	Steel	Unknown	Unknown	Water
DD2	1952	1968	20,000	Steel	Unknown	Unknown	Water
DD3	1952	1968	20,000	Steel	Unknown	Unknown	Water
DD4	1952	1968	20,000	Steel	Unknown	Unknown	Water
DD5	1952	1968	20,000	Steel	Unknown	Unknown	Water
DD6	1952	1968	Unknown	Steel	Unknown	Unknown	Water
DD7	1942	Unknown	500-1000(?)	Steel	Unknown	Unknown	Gasoline
DD8	1952	1956(?)	1,860	Steel	Unknown	Unknown	Unknown-B
DD9	1952	1956(?)	514	Steel	Unknown	Unknown	Unknown-B
DD10	1952	1956(?)	1,200	Steel	Unknown	Unknown	Unknown-B
FF1	Unknown	1970(?)	200(?)	Steel	Unknown	Unknown	Unknown
TT1	1953	1980(?)	1,000	Steel	Asphalt	Unknown	Unknown

Notes:

A. The Manager of Plant Utilities Operation remembers cleaning Tank BB6 in about 1958. He does not believe any material was ever put into the tank by General Electric.

B. Tanks DD8, DD9, and DD10 were used for 3 or 4 years by ANP as LPT Process Water Tanks. A retiree reported they were abandoned full of water.

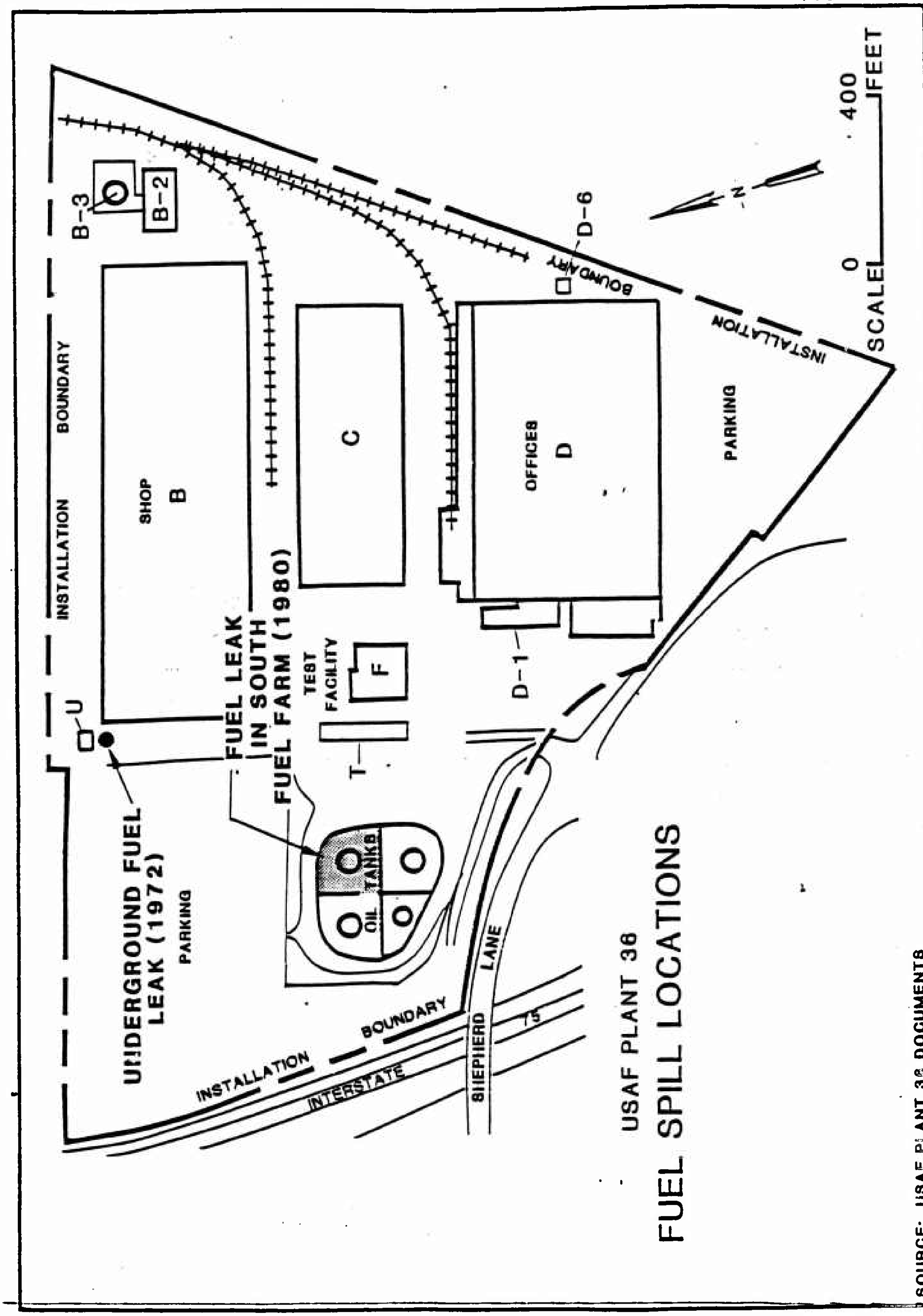
FIGURE 4. 2



USAF PLANT 36

UNDERGROUND TANK LOCATIONS

SOURCE: USAF PLANT 36 DOCUMENTS


USAF PLANT 36
FUEL SPILL LOCATIONS
UNDERGROUND FUEL LEAK (1972)
FUEL LEAK IN SOUTH FUEL FARM (1980)
INSTALLATION BOUNDARY
SHOP
B
C
OFFICES
D
PARKING
PARKING
TEST FACILITY
F
T
U
B-2
B-3
D-1
D-6
OIL TANKS
SHEPHERD LANE
INTERSTATE 75
N
SCALE
0
400
FEET
SOURCE: USAF PLANT 36 DOCUMENTS

the site. Because of the nature and extent of the spill, a potential for environmental contamination exists at this site.

The second spill, which occurred in January 1980, involved the release of approximately 3,900 gallons of JP-5 from the Tank 1 dike at the South Fuel Farm (see Figure 4.2). This fuel was discharged to Mill Creek through Outfall 002. Clean-up operations in Mill Creek were thorough and complete; the fuel which entered Mill Creek was collected and disposed of by outside vendors. A containment dam was constructed in the Outfall 002 drainage ditch and oil absorbent booms were used to contain and control any additional loss. The spill occurred onto the base of the tank area within the dike; this area was a clay and gravel area, and it is expected that some JP-5 was absorbed in the soil. Because of the nature and extent of the spill, a potential for environmental contamination exists at this site.

The third spill of record occurred in August 1983, and involved the release of approximately 100 gallons of a 5% oil-water emulsion from a coolant recycle tank. This material was discharged to Mill Creek through Outfall 001. This spill was cleaned up by containment and removal using oil-specific booms. Because of the nature and size of the spill and the cleanup activities involved, no present potential for environmental contamination is associated with this spill.

Waste Storage Areas

Two underground waste fuel storage tanks (DD2 and DD3 in Table 4.3) are located at the northwest of Building D-1 (see Figure 4.2). These tanks, of 20,000 gallon capacity each, were used to store waste fuels from the Production Unit Test (PUT) Cell during the cell's period of service (1960's until 1973). These tanks were abandoned in place. Abandonment included removing tank contents by pumping and filling with water. At present all hazardous wastes generated on Plant 36 property are stored outside the Plant 36 boundaries on GE property.

Raw Materials Storage Areas

Three raw material drum storage areas exist on Plant 36 property. All three are located at the rear of the plant property, to the east of Building C. The first area is the northernmost, and is east of the roadway which runs north-south at the rear of the plant. This area consists of a concrete pad with surrounding fence on which about 40 drums

were stored at the time of the site visit. No reports of environmental contamination were obtained from plant records, interviews, or visual inspection. The second area, to the west of the roadway, consists of a fenced concrete pad containing about 90 drums at the time of the site visit. No reports of environmental contamination were obtained from plant records, interviews, or visual inspection. The third area, the southernmost one, is east of the roadway and consists of a fenced concrete area with a drain at the south end. This area contained about 150 drums at the time of the site visit and exhibited surficial contamination. The drainage from the site flows into a sump which is connected to the storm sewer system. Because of the nature and extent of the contamination at these sites no potential for environmental contamination is associated with them.

Pesticide Utilization

The pesticide utilization program for Plant 36 has been managed by General Electric personnel for the period of record. Pesticide and rodenticide applications for vector control are made by an outside contractor; herbicide applications are performed by GE personnel. All chemical mixing and equipment cleaning related to herbicides is performed off Plant 36 property. Any excess herbicide as well as empty herbicide containers are stored on GE property for off-site disposal. The quantity of herbicide materials applied to the Plant 36 property is small since almost all the site is covered by buildings or paved areas. The herbicides used and the estimated quantities applied to Plant 36 property are as follows:

DuPont Hyvar soil sterilant, 75 gallons/year

2,4-D weed killer, 15 gallons/year

DESCRIPTION OF PAST TREATMENT AND DISPOSAL METHODS

The facilities on Air Force Plant 36 property which have been used for treatment and disposal of wastes consist of the following:

- o Sanitary Sewer System
- o Oil-Water Separators

Each of these facilities is described in the discussion which follows. No other on-site land treatment or disposal facilities have existed at Plant 36 because of the lack of space and the availability of off-site treatment and disposal facilities.

Sanitary Sewer System

Sanitary wastewater from the Plant 36 property is collected and transported through underground pipes to the sanitary lift station where it is combined with the sanitary wastewater from the G.E. Evendale plant. The combined wastewater is pumped for treatment to the Metropolitan Sewer District (MSD) Mill Creek Plant.

Oil-water Separators

Three oil-water separators are in use in Plant 36 property for the control and collection of oil in water. These separators are described in Table 4.3 and their locations are shown in Figure 4.4. The separators are pumped on an as-needed basis and are cleaned and inspected on a calendar basis to ensure proper operation. The oil phases are removed from the site by an off-site contractor for reclamation. The water phases from the separators are discharged to either the storm sewer or sanitary sewer system as shown in Table 4.4.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

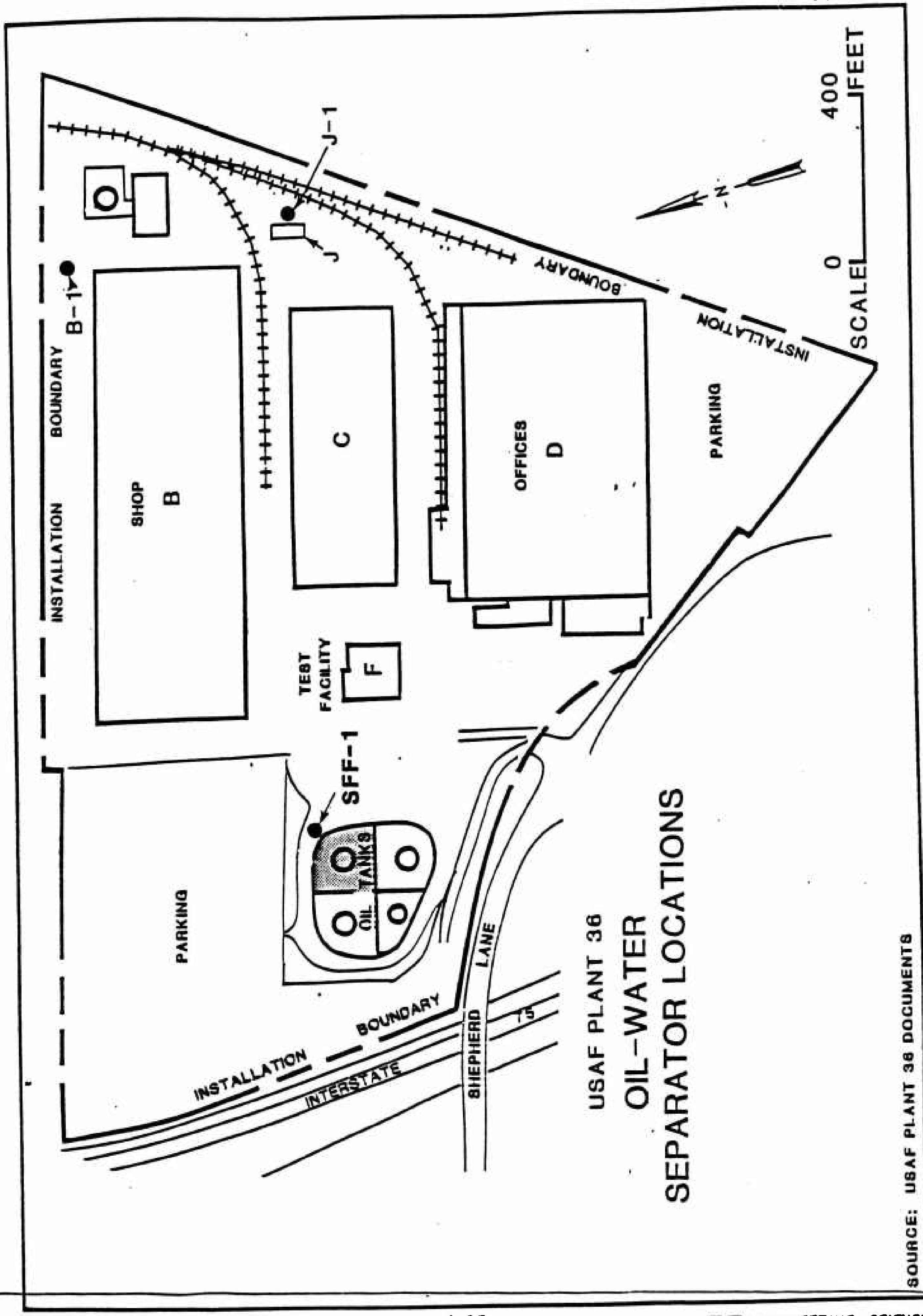
Review of past waste generation and management practices at Air Force Plant 36 has resulted in identification of two sites and/or activities which were considered as areas of concern for potential contamination and migration of contaminants.

Sites Eliminated from Further Evaluation

The sites of initial concern were evaluated using the Flow Chart presented in Figure 1.2. Sites not considered to have a potential for contamination are deleted from further evaluation during this evaluation. The sites which have potential for contamination and migration of contaminants are evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.5 summarizes the results of the flow chart logic for each of the areas of initial concern.

Sites Evaluated Using HARM

The two sites identified in Table 4.5 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into



USAF PLANT 36
OIL-WATER SEPARATOR LOCATIONS

SOURCE: USAF PLANT 36 DOCUMENTS

TABLE 4.4
OIL-WATER SEPARATORS ON AIR FORCE PLANT 36 PROPERTY

Building Number	Location	Use	Capacity (gallons)	Water Phase Disposition
B-1	Northeast of Building B Test Cells	Test Cell Wastes	10,000	Sanitary Sewer
J-1	East of Building J	Drum Storage Wastes	1,000	Sanitary Sewer
SFF-1	South Fuel Farm	Fuel Tank Wastes	5,000	Storm Sewer*

* Monitored prior to release to storm sewer.

TABLE 4.5
SUMMARY OF FLOW CHART LOGIC FOR AREAS OF
INITIAL HEALTH, WELFARE AND ENVIRONMENTAL CONCERN
AT AIR FORCE PLANT 36

Site	Potential Hazard to Health, Welfare or Environment	Need for Further IRP Evaluation/ Action	HARM Rating
Fuel Spill - South Fuel Farm	Yes	Yes	Yes
Underground Fuel Leak - Northwest of Building B	Yes	Yes	Yes

Source: Engineering-Science

account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. Results of the HARM analysis for the sites are summarized in Table 4.6.

The procedures used in the HARM system are outlined in Appendix E and the specific rating forms for the two sites at Air Force Plant 36 are presented in Appendix F. The HARM system is designed to indicate the relative need for follow-on action.

TABLE 4.6
SUMMARY OF HARM SCORES FOR
POTENTIAL CONTAMINATION SITES
AT AIR FORCE PLANT 36

Rank	Site	Receptor Subscore	Waste Charac-teristics Subscore	Pathways Subscore	Waste Management Factor	HARM Score
1	Underground Fuel Leak, Northwest of Building B	52	40	74	0.95	52
2	Fuel Spill in South Fuel Farm	52	40	54	0.95	46

Note: HARM Score = [(Recepters + Waste Characteristics + Pathways) x 1/3] x Waste Management Factor

Source: Engineering-Science

SECTION 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contamination migration from these sites. The conclusions given below are based on field inspections; review of records and files; review of the environmental setting; interviews with plant personnel and local, state and federal government employees; and assessments using the HARM system. Table 5.1 contains a list of the potential contamination sources identified at Air Force Plant 36 and a summary of the HARM scores for those sites.

UNDERGROUND FUEL LEAK NORTHWEST OF BUILDING B

There is sufficient evidence that the underground fuel leak northwest of Building B (at Building U) has potential for creating environmental contamination and a follow-on investigation is warranted. The fuel leak, which occurred in 1972, resulted in the excavation of visually contaminated soil. No soil sampling or ground-water sampling was performed at the site. The fuel leak site is located in clay to clay loam surface soils with moderate permeabilities but is underlain by deeper stratified sand and gravel with high permeabilities at approximately three feet deep. Ground water is present at a depth of ten feet. The site received a HARM score of 52, in part because the restraints of the HARM system required application of a Waste Management Factor of 0.95. However, the cleanup at the site immediately after the incident would indicate a lower Waste Management Factor, and hence, a lower final HARM score would be more realistic.

FUEL SPILL AT SOUTH FUEL FARM

There is not sufficient evidence that the fuel spill at the South Fuel Farm has potential for creating environmental contamination and a

TABLE 5.1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY
AT AIR FORCE PLANT 36

Rank	Site	Operation Period	HARM Score (1)
1	Underground Fuel Leak Northwest of Building B	1972	52
2	Fuel Spill at South Fuel Farm	1980	46

(1) This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix E. Individual rating forms are in Appendix F.

follow-on investigation is not warranted. However, confirmation of the absence of significant contamination is advisable prior to installation of a synthetic liner system. The spilled fuel at this site reached Mill Creek via storm sewers. The soil underlying the South Fuel Farm consists of clay and clay loam surface soils with moderate permeabilities but is underlain by deeper stratified sand and gravel with high permeabilities at approximately three feet deep. Ground water is present at a depth of ten feet. The site received a HARM score of 46.

SECTION 6

RECOMMENDATIONS

Two sites were identified at Air Force Plant 36 as having the potential for environmental contamination. These sites have been evaluated and rated using the HARM system which assesses their relative potential for contamination and provides the basis for determining the need for additional Phase II IRP investigations. One of the two sites has sufficient potential to create environmental contamination and warrants a Phase II investigation. The sites evaluated have been reviewed concerning land use restrictions which may be applicable.

RECOMMENDED PHASE II MONITORING

General

The subsequent recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Air Force Plant 36. The recommended actions are sampling and monitoring programs to determine if contamination does exist at the site. If contamination is identified in this first-step investigation, the Phase II sampling program will probably need to be expanded to define the extent and type of contamination. The recommended monitoring program is summarized in Table 6.1 and discussed below for the site. Soil sampling and ground-water monitoring well installations should be performed using the hollow-stem auger/split-spoon method. Split-spoon samples should be collected continuously. Wells should be installed using four-inch diameter PVC threaded casing and screens. The screens should be open to the full saturated thickness of the upper Mill Creek Valley aquifer and at least three feet above the water table to allow any fuel to enter the well. The annular seal should be at least one foot below ground level. During soil sampling and well installations an organic vapor analyzer

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT AIR FORCE PLANT 36

Site (Rating Score)	Recommended Monitoring Program
Underground Fuel Leak Northwest of Building B (52)	One soil boring and subsequent monitoring well for confirmation of contamination. If confirmed, three additional wells to define extent of contamination. Soil and ground-water analyses (see Table 6.2).
Fuel Leak in South Fuel Farm Area	One soil boring by hand auger technique for confirmation of contamination. If confirmed, three additional borings to define extent of contamination. Soil analyses (see Table 6.2).

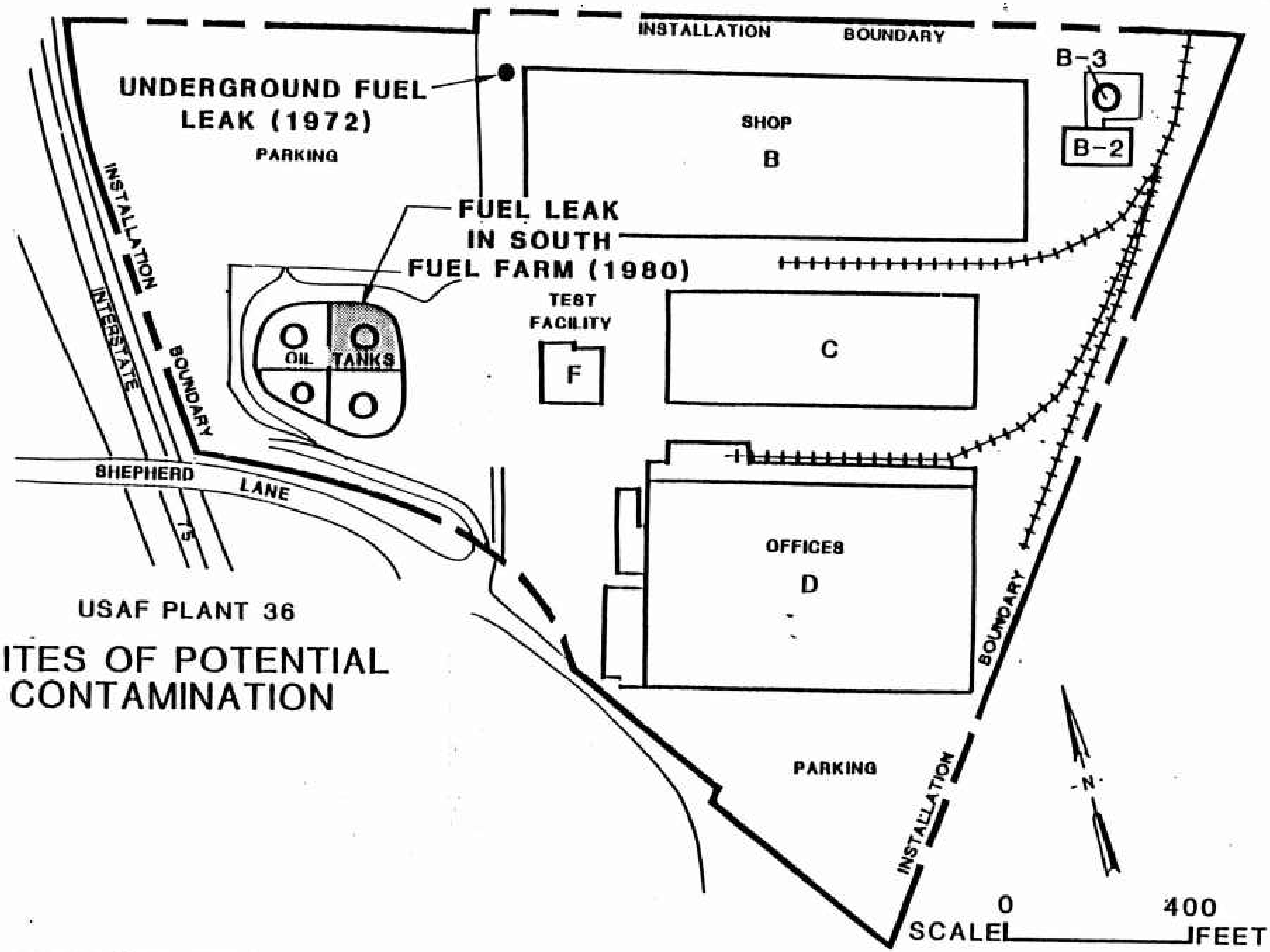
Source: Engineering-Science.

(OVA), HNU meter or equivalent and an explosimeter should be used. Selected soil samples and ground-water samples should be collected for chemical analyses as subsequently described.

Site-Specific Recommendations

The two sites for which the subsequent recommendations are made are shown in Figure 6.1. The underground fuel leak northwest of Building B (at Building U) has a potential for environmental contamination and monitoring of this site is recommended. One soil boring within the area of the fuel line excavation should be drilled to an approximate depth of 40 feet or until confining clay layer is encountered. Selected soil samples (approximately 8) should be analyzed for the parameters in Table 6.2, List A. Following the soil boring and sampling a monitoring well should be installed within the borehole and the ground water analyzed for the parameters in Table 6.2, List B. If ground water contamination is confirmed, a minimum of three additional wells should be installed downgradient of the site to determine the extent of ground-water contamination. A Geo-Flow Meter or equivalent equipment should be utilized to aid in the determination of ground-water flow rates and flow directions.

The fuel leak in the south fuel farm area has a minor potential for environmental contamination and monitoring of this site is recommended. One soil boring using the hand auger technique to an approximate depth of 10 feet should be completed. Selected soil samples (approximately three) should be analyzed for the parameters in Table 6.2, List A. If soil contamination is confirmed at least three additional borings should be completed to determine the extent of soil contamination.



USAF PLANT 36

SITES OF POTENTIAL CONTAMINATION

SOURCE: USAF PLANT 36 DOCUMENTS

TABLE 6.2
RECOMMENDED LIST OF
ANALYTICAL PARAMETERS FOR PHASE II IRP
AT AIR FORCE PLANT 36

List A

Soil Analyses	EPA Method Number
Oil and Grease	413.2
Purgeable Organics	8240

List B

Ground-Water Analyses	
Oil and Grease	413.2
pH	150.1
Specific Conductance	120.1
Temperature	170.1
Volatile Organics	624

Source: Engineering-Science

TABLE OF CONTENTS
APPENDICES

APPENDIX A

BIOGRAPHICAL DATA

Biographical Data

H. DAN HARMAN, JR.
Hydrogeologist

PII Redacted

[redacted]

Education

B.S., Geology, 1970, University of Tennessee, Knoxville, TN

Professional Affiliations

Registered Professional Geologist (Georgia NO.569)
National Water Well Association (Certified Water Well Driller No. 2664)
Georgia Ground-Water Association

Experience Record

1975-1977 Northwest Florida Water Management District, Havana, Florida. Hydrogeologist. Responsible for borehole geophysical logger operation and log interpretation. Also reviewed permit applications for new water wells.

1977-1978 Dixie Well Boring Company, Inc., LaGrange, Georgia. Hydrogeologist/Well Driller. Responsible for borehole geophysical logger operation and log interpretation. Also conducted earth resistivity surveys in Georgia and Alabama Piedmont Provinces for locations of water-bearing fractures. Additional responsibilities included drilling with mud and air rotary drilling rigs as well as bucket auger rigs.

1978-1980 Law Engineering Testing Company, Inc., Marietta, Georgia. Hydrogeologist. Responsible for ground-water resource evaluations and hydrogeological field operations for government and industrial clients. A major responsibility was as the Mississippi Field Hydrologist during the installation of both fresh and saline water wells for a regional aquifer evaluation related to the possible storage of high level radioactive waste in the Gulf Coast Salt Domes.

1980-1983 Ecology and Environment, Inc., Decatur, Georgia. NUS Corporation, Tucker, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites. Also prepared Emergency Action Plans and Remedial Approach Plans for U.S. Environmental Protec-

1980-1983 tion Agency. Additional responsibilities included use of the MITRE hazardous ranking system to rank sites on the National Superfund List.

1983-Date Engineering-Science, Inc., Atlanta, Georgia. Hydrogeologist. Responsible for hydrogeological and geophysical investigations at inactive and active hazardous waste sites. Hydrogeological investigations include evaluation of existing groundwater monitoring systems, installation of new groundwater monitoring wells, ground water and soil sampling, preparation of Part B applications, closure and post-closure plans and hazard assessment ratings. Geophysical investigations include surface electrical resistivity and magnetometer surveys to aid in the delineation of waste site boundaries, contents, covers and underlying hydrogelogical features, as well as adjacent hydrogeological features and groundwater contamination plumes migrating from sites.

Publications and Presentations

"Geophysical Well Logging: An Aid in Georgia Ground-Water Projects," 1977, coauthor: D. Watson, The Georgia Operator, Georgia Water and Pollution Control Association.

"Use of Surface Geophysical Methods Prior to Monitor Well Drilling," 1981. Presented to Fifth Southeastern Ground-Water Conference, Americus, Georgia.

"Cost-Effective Preliminary Leachate Monitoring at an Uncontrolled Hazardous Waste Site," 1982, coauthor: S. Hitchcock. Presented to Third National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington, D.C.

"Application of Geophysical Techniques as a Site Screening Procedure at Hazardous Waste Sites," 1983, coauthor: S. Hitchcock. Proceedings of the Third National Symposion and Exposition on Aquifer Restoration and Ground-Water Monitoring, Columbus, Ohio.

"Practical Application of Earth Resistivity Methods in Phase II of the Installation Restoration Program," 1984, coauthor: J. Baker. Presentation at the 13th Environmental Systems Symposium, American [illegible] Preparedness Association, Bethesda, Maryland.

"[illegible]rch of North Georgia's Ground Water: Application of Geophysics and Hydrogeology," 1984, coauthors: J. Baker and S. Yankee. The Georgia Operator, Georgia Water and Pollution Control Association.

BIOGRAPHICAL DATA

Eric Heinman Snider

Manager, Industrial Waste Department

PII Redacted

[redacted]

Education

B.S. in Chemistry (Magna Cum Laude), 1973, Clemson University, Clemson, S.C.
M.S. in Chemical Engineering, 1975, Clemson University, Clemson, S.C.
Ph.D. in Chemical Engineering, 1978, Clemson University, Clemson, S.C.

Professional Affiliations

Registered Professional Engineer (Oklahoma No. 13499, Georgia No. 14228)
Diplomate, American Academy of Environmental Engineers
Certified Professional Chemist, A.I.C.
American Institute of Chemical Engineers
American Chemical Society
American Society for Engineering Education
Society of Automotive Engineers

Honorary Affiliations

Sigma Xi
Tau Beta Pi
Phi Kappa Phi
Who's Who in the South and Southwest, 1981
Outstanding Young Men of America, 1983

Experience Record

1971-1978 Texidyne, Inc., Clemson, S.C., Staff Chemist and Consultant. Responsible for overall management of laboratory facilities and some wastewater engineering studies. Performed incinerator performance studies. Participated in a study to examine feasibility of process wastewater recycle/reuse in textile finishing and dyeing operations.

Eric H. Snider (Continued)

1976-1977	Clemson University, Clemson, S.C., Chief Analyst on airborne fluoride monitoring project in Chemical Engineering Department, performed for Owen-Corning Fiberglas Corp., Toledo, Ohio.
1978-1982	The University of Tulsa, Tulsa, OK., Assistant Professor of Chemical Engineering and Associate Director, University of Tulsa Environmental Protection Projects (UTEPP) Program. Normal teaching duties; research centered on specialized petroleum refinery problems of water and solid wastes and oil-water emulsions. Supervised an industry-sponsored research program in the area of oil-water emulsion breaking technologies.
1982-1983	The University of Tulsa, Tulsa, OK., Associate Professor of Chemical Engineering and Director of UTEPP Program. Normal teaching duties; researched and wrote five monographs on environmental areas; including, incineration, flotation, gravity separation, screening/sedimentation, and equalization.
1983-1984	Engineering-Science, Senior Engineer. Responsible for a wide variety of waste treatment, chemical process, resource recovery, energy, incineration and air pollution control activities for industrial and governmental clients.
1984-Date	Engineering-Science, Manager of Industrial Waste Department. Responsible for managing a department consisting of chemical, civil, and environmental engineers and scientists performing a variety of projects for industrial and municipal clients.

<u>Publications</u>

32 technical publications, including five technical monographs.

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

TABLE B.1
LIST OF INTERVIEWEES

Most Recent Position*	Years of Service at this Installation
1. Civilian Facilities Engineer	34
2. Civilian Fuels System Manager	18
3. Civilian Manager, Production Engine Test	7
4. Civilian Manager, Environmental Systems	12
5. Civilian Manager, Development Engine Test	10
6. Civilian Quality Lab Chemist	27
7. Civilian Grounds Planner	1
8. Civilian Quality Lab Chemist	33
9. Civilian Assistant Chief of Security	1
10. Civilian Environmental Engineer	1
11. Civilian Facilities Designer	28
12. Civilian Utilities Engineer	19
13. Civilian Industrial Hygienist	33
14. Civilian Health and Safety Specialist-Decontamination	29
15. Civilian Supervisor, Facilities Maintenance	1
16. Civilian Facilities Manager	10
17. Civilian Manager, Plant Utilities	34
18. Civilian Maintenance Manager, Building Test	12

* All interviewees were employees of General Electric Company.

TABLE B.2
OUTSIDE AGENCY CONTACTS

City of Reading Water Plant Reading, Ohio (513) 554-1190	Don Shorter Chief Operator
City of Wyoming Water Department Wyoming, Ohio (513) 821-8044	Water Department Clerk
Hamilton County Health Department 138 East Court Street Cincinnati, Ohio 45202 (513) 632-8458	Larry McGraw Supervisor for Plumbing
Ohio Environmental Protection Agency Division of Solid and Hazardous Waste Management 361 East Broad Street Columbus, Ohio 43216 (614) 449-6357	Paul Perdi Inspector
Ohio Environmental Protection Agency Division of Solid and Hazardous Waste Management 7 East 4th Street Dayton, Ohio (513) 461-4670	Darryl Fowler Inspector
Ohio Environmental Protection Agency Division of Water Quality and Monitoring 361 East Broad Street Columbus, Ohio 43216 (614) 466-9092	Dick Roberts Supervisor

TABLE B.2
(Continued)
OUTSIDE AGENCY CONTACTS

Ohio Environmental Protection Agency Division of Water Supply-Ground Water 361 East Broad Street Columbus, Ohio 43216 (614) 466-8307	Dr. Kenneth Applegate Director
Ohio Department of Natural Resources Division of Water Water Planning Fountain Square, Bldg. E-3 Columbus, Ohio 43224 (614) 265-6757	Arthur F. Woldorf Supervisor
Ohio Department of Natural Resources Division of Water Flood Plain Management Fountain Square, Bldg. E-3 Columbus, Ohio 43224 (614) 265-6753	Diana L. Simms Supervisor
Ohio Department of Natural Resources Division of Water Water Inventory Section Fountain Square, Bldg. E-3 Columbus, Ohio 43224 (614) 265-6739	Mike Hallfrisch Geologist
Ohio Department of Natural Resources Division of Wildlife Fountain Square, Bldg. C-3 Columbus, Ohio 43224 (614) 265-6338	Dennis Case Biologist
Ohio-Kentucky-Indiana Regional Council of Governments 426 East 4th Street Cincinnati, Ohio 45202 (513) 621-7060	Dory Montezumi Assistant Director

TABLE B.2
(Continued)
OUTSIDE AGENCY CONTACTS

Southwestern Ohio Water Company 11137 Main Street Sharonville, Ohio (513) 554-1188	Frank Divo Director
U.S. Fish and Wildlife Service 3990 East Broad Street Columbus, Ohio 43216 (614) 231-3416	Kent Krooneneyer Wildlife Supervisor
U.S. Geological Survey, Water Resources Division 975 West Third Avenue Columbus, Ohio 45202 (614) 469-5553	Ann Arnett Information Officer
U.S. Environmental Protection Agency Region 5 Hazardous Waste Section 230 South Dearborn Street Chicago, Illinois 60604 (312) 886-6747	Rose Freeman State Coordinator

APPENDIX C

MASTER LIST OF SHOPS

TABLE C.1
MASTER LIST OF SHOPS

Name	Location	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
Advanced Energy Program Development (AEPD)				
Cleaning and Plating Shop	D	Yes	Yes	Neutralization to MSD
Cleaning Line	D	Yes	Yes	Off-site contractor
Rhodine Leach Process	D	Yes	Yes	Evaporation, salt to off-site contractor
Machine Shop	D	Yes	Yes	Off-site contractor
Laboratories	D	Yes	Yes	Off-site contractor
Nuclear Systems Shops	D,C-West	Yes	Yes	Off-site contractor
Aircraft Engine Business Group (AEBG)				
Plating Line	C-East	Yes	Yes	Neutralization to MSD
Bonderite Facility	C-East	Yes	Yes	Neutralization to MSD
Wingtip Paint Booths	C-East	Yes	Yes	Off-site contractor
Bonderite Paint Booths	C-East	Yes	Yes	Off-site contractor
Grinding/Deburring Shop	C-East	Yes	Yes	Off-site contractor

TABLE C.1
MASTER LIST OF SHOPS
(Continued)

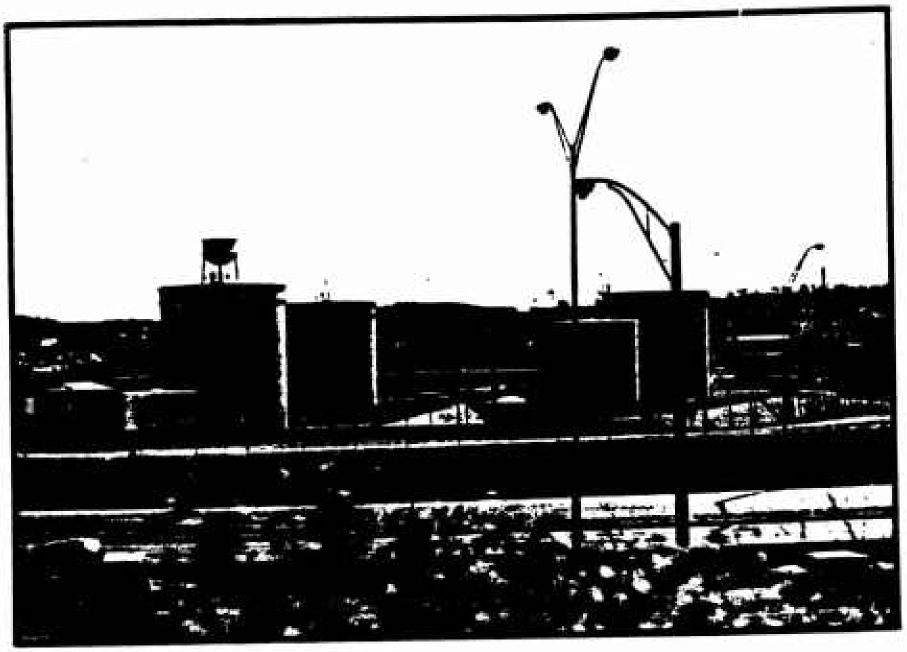
Name	Location	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
Hollow Blade Facility, Electrostream Drilling Shop	B	Yes	Yes	Neutralization to MSD
J-47 Engine Overhaul Plating Area	B	Yes	Yes	Neutralization to MSD
Engine Assembly Area	B	Yes	Yes	Off-site contractor
Plasma Spray	B	Yes	Yes	Off-site contractor
Laboratory	B	Yes	Yes	Off-site contractor
Thrust Reverser Manufacturing Shop	B	Yes	Yes	Off-site contractor
Engine Test Cells	B	Yes	Yes	Off-site contractor

Note: MSD = Metropolitan Sewer District.

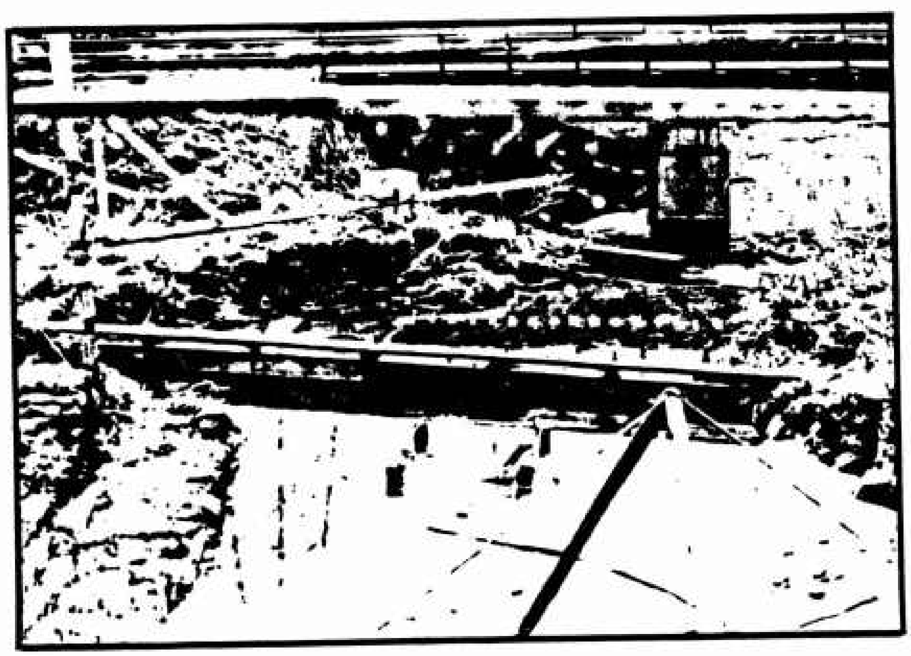
APPENDIX D

PHOTOGRAPHS

USAF PLANT 36

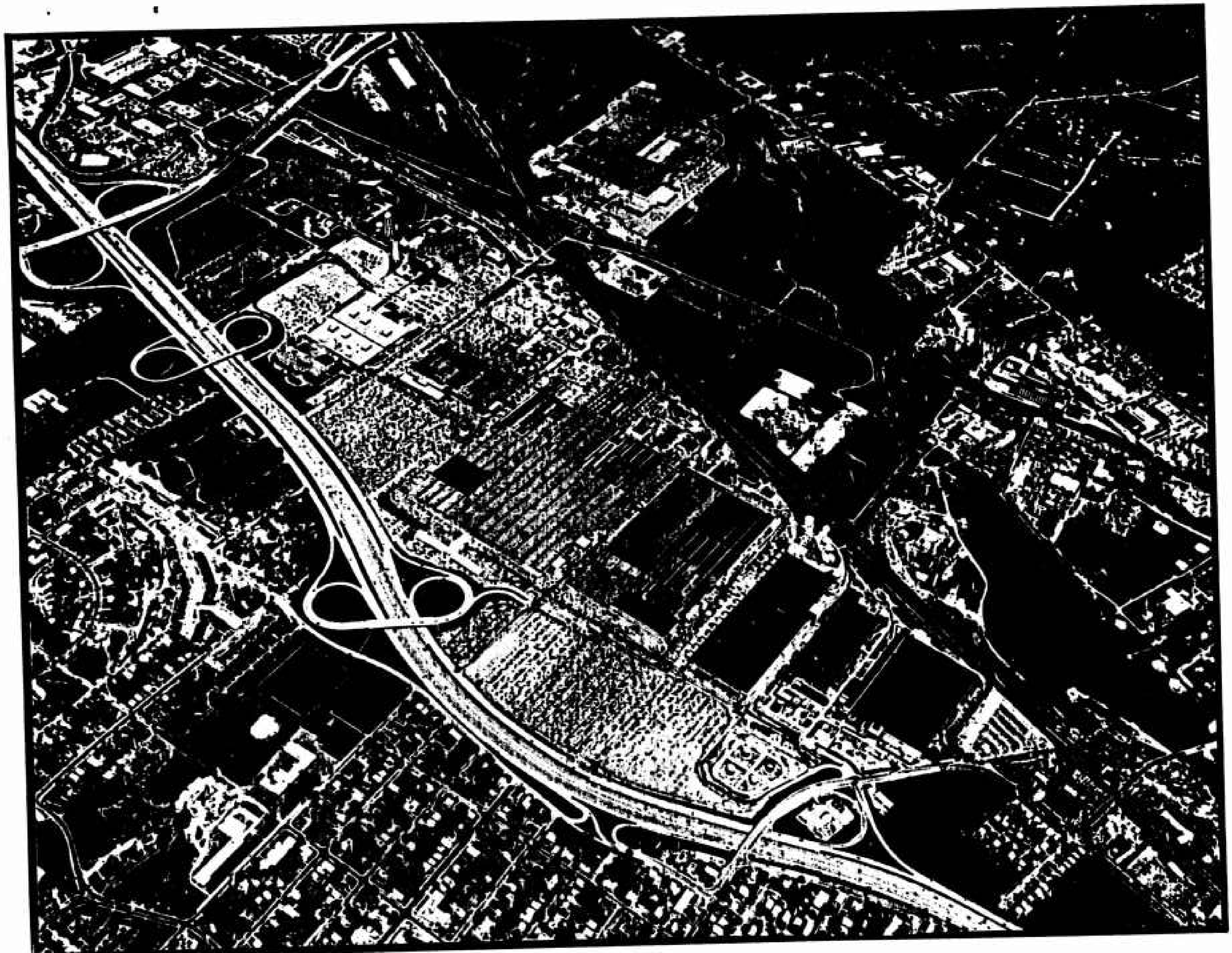


South Fuel Farm, Observer Facing East



Outfall 001, Observer Facing East

Outfall 002, Observer Facing West



AIR FORCE PLANT 36

1979

APPENDIX E

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX E

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

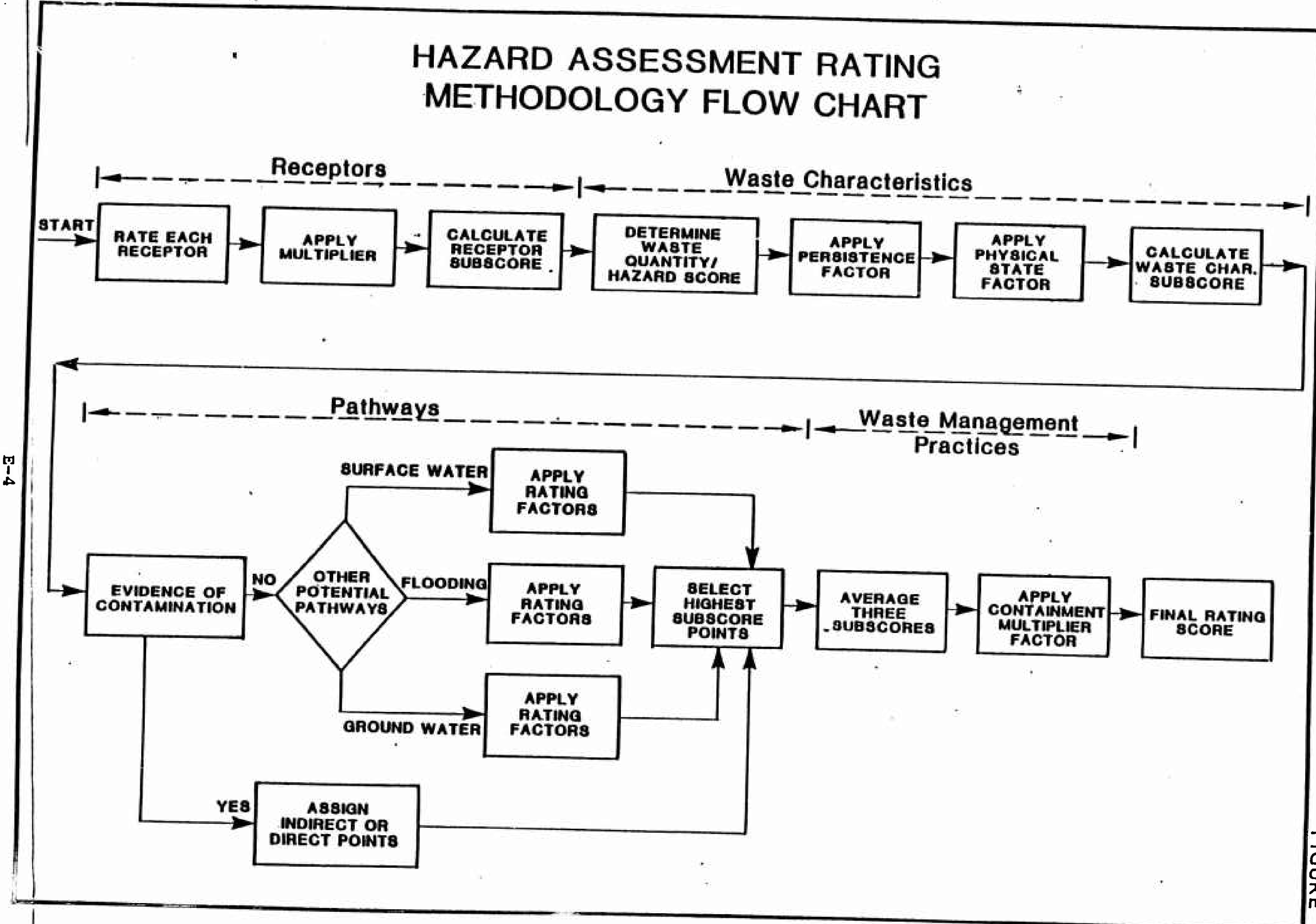

HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
EVIDENCE OF CONTAMINATION
NO
OTHER POTENTIAL PATHWAYS
SURFACE WATER
FLOODING
GROUND WATER
APPLY RATING FACTORS
APPLY RATING FACTORS
APPLY RATING FACTORS
YES
ASSIGN INDIRECT OR DIRECT POINTS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	H
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	H
	L	C	L
	M	S	H
	S	C	H
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX F

SITE HAZARD ASSESSMENT RATING FORMS

APPENDIX F

INDEX FOR HAZARD ASSESSMENT

METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Fuel Leak
Location: Northwest of building B
Date of Operation: 1972
Owner/Operator: Air Force Plant 36
Comments/Description: Broken line entering building U

Site Rated by: E.H.S.; H.D.H.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			93	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) S = small
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) M = medium

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 0.80 = 40

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.00 = 40

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	3	8	24	24
Subtotals			84	114
Subscore (100 x factor score subtotal/maximum score subtotal)				74

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 74

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		52
Waste Characteristics		40
Pathways		74
Total	165 divided by 3 =	55 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

55 x 0.95 = 52

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Fuel Leak in POL Area
Location: POL Area
Date of Operation: 1980
Owner/Operator: Air Force Plant 36
Comments/Description: Northeast tank diked area

Site Rated by: E.H.S; H.D.H.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			93	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) S = small
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) M = medium

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 0.80 = 40

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.00 = 40

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			52	114
Subscore (100 x factor score subtotal/maximum score subtotal)				46

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		52	
Waste Characteristics		40	
Pathways		54	
Total	145 divided by 3 =		48 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

48 x 0.95 = 46

FINAL SCORE

APPENDIX G
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

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GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

AF: Air Force.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent.

AFPRO: Air Force Plant Representative Office

AFR: Air Force Regulation.

AFRCE: Air Force Regional Civil Engineer.

AFSC: Air Force Systems Command.

Ag: Chemical symbol for silver.

Al: Chemical symbol for aluminum.

ALLUVIUM: Materials eroded, transported and deposited by streams.

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

ARTESIAN: Ground water contained under hydrostatic pressure.

ASD: Aeronautical Systems Division

Ba: Chemical symbol for barium.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

Cd: Chemical symbol for cadmium.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act.

CIRCA: About; used to indicate an approximate date.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation.

CN: Chemical symbol for cyanide.

COBBLE: A specific grain size classification of geologic sediments from 2.5 to 10 inches in diameter.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

COE: Corps of Engineers.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: A poorly permeable layer which restricts the movement of ground water.

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water.

Cr: Chemical symbol for chromium.

Cu: Chemical symbol for copper.

DIP: The angle at which a stratum is inclined from the horizontal.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure.

DOD: Department of Defense.

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

Fe: Chemical symbol for iron.

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient.

FPTA: Fire Protection Training Area.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds.

GE: General Electric Company

GLACIAL TILL: Unsorted and unstratified drift consisting of clay, sand, gravel and boulders which is deposited by or underneath a glacier.

GRAVEL: A general grain size classification of geologic sediments from 0.08 to greater than 10 inches in diameter.

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water.

HARM: Hazard Assessment Rating Methodology.

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste.

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations.

Hg: Chemical symbol for mercury.

HWMF: Hazardous Waste Management Facility.

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic

dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LENTICULAR: A bed or rock stratum or body that is lens-shaped.

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

MEK: Methyl Ethyl Ketone.

METHYL CHLOROFORM: 1,1,1, Trichloroethane.

MGD: Million Gallons per Day.

MILLI: Prefix representing 1/1000, m

MICRO: Prefix representing 1/1,000,000, u.

Mn: Chemical symbol for manganese.

MONITORING WELL: A well used to measure ground-water levels and to obtain samples.

MORAINE: An accumulation of glacial drift deposited cheifly by direct glacial action and possessing initial constructional form independent of the floor beneath it.

MSD: Metropolitan Sewer District.

MSL: Mean Sea Level.

NDT: Non-destructive Testing.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NGVD: National Geodetic Vertical Datum of 1929.

Ni: Chemical symbol for nickel.

NPDES: National Pollutant Discharge Elimination System.

OEHL: Occupational and Environmental Health Laboratory.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

O&G: Symbols for oil and grease.

Pb: Chemical symbol for lead.

PERCHED WATER TABLE: The top of a zone of saturation that bottoms on an impermeable horizon above the level of the general water table in an area.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERENNIAL: A stream which flows continuously.

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

pH: Negative logarithm of hydrogen ion concentration.

PL: Public Law.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POTENTIOMETRIC SURFACE: The imaginery surface to which water in an artesian aquifer would rise in tightly screened wells penetrating it.

PPB: Parts per billion by weight.

PPM: Parts per million by weight.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

RCRA: Resource Conservation and Recovery Act.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

RECHARGE: The addition of water to the ground-water system by natural or artificial processes.

RIPARIAN: Living or located on a riverbank.

SALINE: Water having a dissolved solids content greater than 1,000 milligrams per liter.

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SLUSH OIL: An oil used to flush fuel from aircraft engines and left in engines during shipment.

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water.

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

STP: Sewage Treatment Plant.

TCE: Trichloroethylene.

TDS: Total Dissolved Solid, a water quality parameter.

TOC: Total Organic Carbon.

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

TSD: Treatment, storage or disposal.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water.

USAF: United States Air Force.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

Zn: Chemical symbol for zinc.

APPENDIX H

REFERENCES

APPENDIX I

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SITES

AT AIR FORCE PLANT 36

APPENDIX H

REFERENCES

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APPENDIX I

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APPENDIX I

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SITES

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